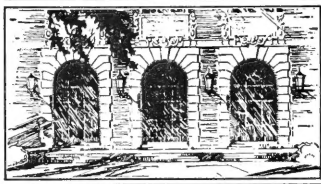


LIBRARY OF THE
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

595.79
Sa8h

Biology



FEB 8 1979

The person charging this material is responsible for its return to the library from which it was withdrawn on or before the **Latest Date** stamped below.

Theft, mutilation, and underlining of books are reasons for disciplinary action and may result in dismissal from the University.

UNIVERSITY OF ILLINOIS LIBRARY AT URBANA-CHAMPAIGN

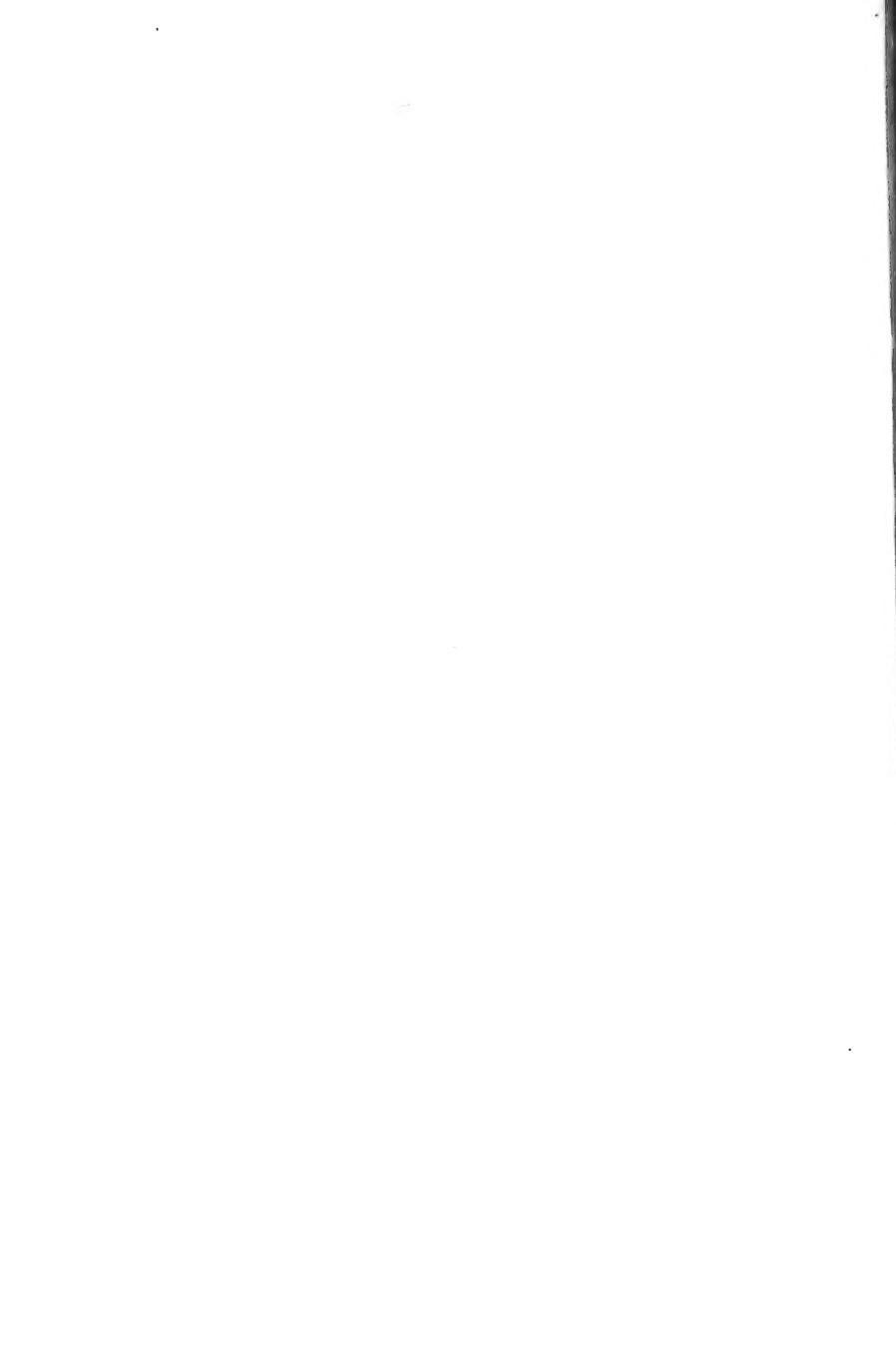
AUG 4 1975

MAY 27 1984

JUN 13 2006

JAN 02 2006





HYMENOPTERA ACULEATA.



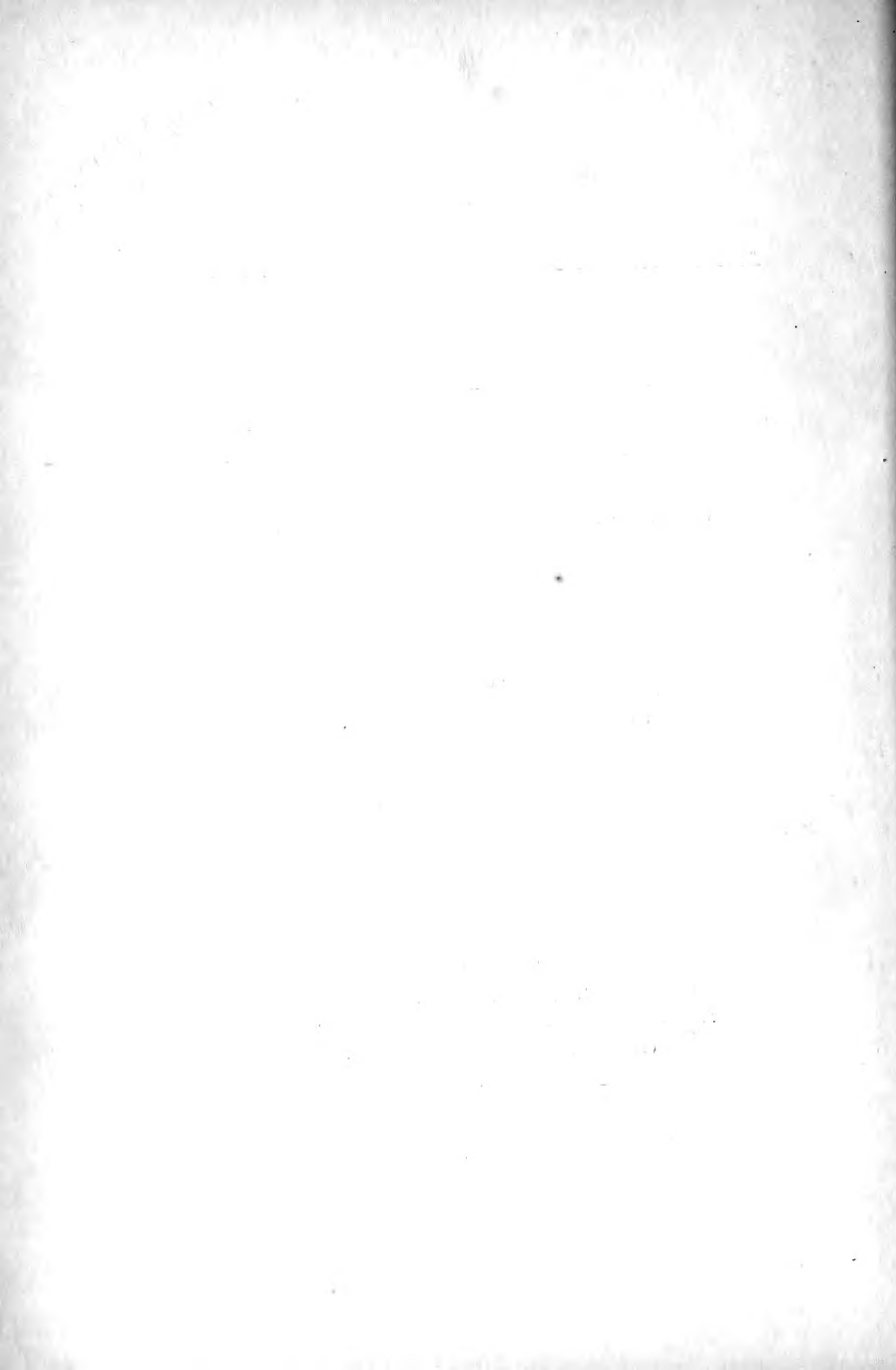
155

THE
HYMENOPTERA ACULEATA
OF THE
BRITISH ISLANDS.

A DESCRIPTIVE ACCOUNT OF THE FAMILIES, GENERA, AND
SPECIES INDIGENOUS TO GREAT BRITAIN AND IRELAND,
WITH NOTES AS TO HABITS, LOCALITIES, HABITATS,
ETC.

BY
EDWARD SAUNDERS, F.L.S.

LONDON:
L. REEVE & CO.,
Publishers to the Home, Colonial, and Indian Governments,
6, HENRIETTA STREET, COVENT GARDEN.
1896.



1
Sara

PREFACE.

THERE are few people who are not more or less interested in ants, bees, and wasps, and their habits, and yet there are very few who systematically take up their study. Probably this is, to a certain extent, due to the somewhat uncompromisingly scientific look of the literature offered to them, and it is hoped that the coloured figures in the larger edition of this work will remove, at any rate to a certain extent, the apparent difficulties of the subject.

The study of the aculeates is full of interest. On account of their nest-making habits they lend themselves peculiarly well to an investigation of their life histories, which abound in interesting details. The diversity of their structure also, and the wonderful specialization of the various organs of each species to its necessary habits, give a field for examination and study possessed, the writer thinks, by no other group of insects.

The fertilization of plants depends greatly on their visits, and there seems to be in many cases a distinct correlation of structure between insect and flower, the short-tongued bees visiting only flowers whose honey is near the surface, as in such orders as the *Rosaceæ*, *Compositæ*, &c., the flowers with long tubes, such as those of the *Labiata* tribe, being dependent, so far as the Hymenoptera are concerned, on the visits of the long-tongued bees. Hermann Müller, in his celebrated work, "Die Befruchtung der Blumen, &c.," has gone very carefully into this subject, and at the present time Messrs. Willis & Burkill are publishing, in

1893

Entomological Research 17 Nilg 2001470 19 F 15 214

the "Annals of Botany," observations on "Flowers and Insects in Great Britain," giving the names of the insect visitants of the various flowers in the localities where they have been able to make observations.

The principal works on the Hymenoptera Aculeata of this country are the following:—

Kirby, "*Monographia Apum Angliæ* (1802)," the classical work on the British Anthophila; Shuckard, "Essay on the Indigenous Fossorial Hymenoptera," 1837; F. Smith, "Catalogue of British Hymenoptera, in the Collection of the British Museum, Part I., Apidæ," 1855, and 2nd edition of the same, 1876; "Catalogue of British Fossorial Hymenoptera Formicidæ and Vespidæ," in the same collection, 1858; E. Saunders, "Synopsis of the British Hymenoptera" *Heterogyna* and *Fossores*, Trans. Ent. Soc. Lon. 1880, pp. 201-300; *Diptoptera* and *Andrenidæ*, *ibid.*, 1882, pp. 165-290; *Apidæ*, *ibid.*, 1884, pp. 159-250. The above works give descriptions of all the British species known at the dates of their publication. Besides these strictly technical treatises, the Rev. W. Farren White has published, without date, a volume entitled "Ants, and their Ways," which gives a popular account of the habits of the ants of the British Isles, and, in an appendix, short descriptions of the species; and Shuckard, in 1866, published his "British Bees," a semi-popular work, giving descriptions of the various genera of the *Anthophila*, with copious notes on habits, &c., illustrated with coloured plates.

Very many interesting observations and experiments on instincts and faculties are recorded by Sir John Lubbock, in the Journal of the Linnean Society 1874-81, and in his well-known popular work, "Ants, Bees, and Wasps," published in 1882.

Of Continental works, other than monographs on special groups, the only one likely to be of use in the determination of the British aculeates is C. G. Thomson's "Hymen-

optera Scandinaviæ," but this does not include the ants. Two exhaustive works on European Hymenoptera Aculeata have been commenced: Schmiedeknecht, "*Apidæ Europææ*," and André, "*Species des Hyménoptères d'Europe et d'Algérie*." Of the former, two volumes only have appeared, treating of the genera *Nomada*, *Psithyrus*, *Bombus*, *Andrena*, and *Osmia*; while the latter, so far, has dealt only with the *Heterogyna*, *Vespidæ*, and part of the *Sphegidae*.

The present work owes much, as will be seen in its pages, to the important papers on special groups of v. Hagens, Handlirsch, Kohl, Perez, and Schletterer, to the Council of the Linnean Society for permission to reproduce the figures of tongues on Plates 1A and 1B, and to that of the Entomological Society of London for similar permission as regards the figures of details scattered throughout the plates of this work, as well as to the assistance in various ways of the following entomologists; the late Frederic Smith, whose kindness to the author, in determining doubtful specimens and in helping whenever applied to, will always be in his memory; Messrs. A. Beaumont; W. H. Bennett; G. C. Bignell; T. R. Billups; E. A. Butler; Rev. E. N. Bloomfield; J. B. Bridgman; G. H. Carpenter; H. S. Cuthbert; C. W. Dale; F. Enock; P. Freke; G. E. Frisby; Willoughby Garduer; W. H. Harwood; T. McGregor; R. McLachlan; E. G. Marquand; Rev. T. A. Marshall; P. B. Mason; Rev. F. D. Morice; R. Newstead; R. C. L. Perkins; Vincent R. Perkins; A. Piffard; H. Ramsden; G. A. J. Rothuey; F. W. L. Sladen; Dr. H. Swale; W. H. Tuck; and to the following local lists: Devon, (*Parfitt*); Gloucestershire, (*P. R. Perkins*); Hastings and St. Leonards and vicinity; Lancashire and Cheshire, (*Gardner*); Land's End, (*Marquand*); Norfolk, (*Bridgman*); Rugby, (*Morice*); Yorkshire, (*Liebeck*).

It has been thought by some that notes on the distri-

bution of the species outside the British Isles could be usefully added to the localities given, but there is so much doubt about the identity of many of the British and Continental species which bear the same names, and different countries have been so unequally worked by collectors, that to define areas at present would, if the author may adapt an expression from a critic of his former work on *Hemiptera Heteroptera*, throw more light on the distribution of Hymenopterists than on that of Hymenoptera.

The species of Hymenoptera Aculeata now known to be indigenous to this country number 374. Of these 20 belong to the *Heterogyna*, or Ants; 127 to the *Fossores*, or Sand Wasps; 23 to the *Diploptera*, or true Wasps; and 204 to the *Anthophila*, or pollen-collecting Bees. There are, no doubt, others yet to be found, and the author trusts that all who have doubtful specimens will send them to him for examination, as he is always ready to be of use if possible, and it is amongst the doubtful ones that additions to our fauna are likely to be discovered.

EDWARD SAUNDERS.

ST. ANN'S, WOKING
February, 1896.

HYMENOPTERA ACULEATA.

INTRODUCTION.

THE Hymenoptera, which include the Bees, Wasps, Ants, Ichneumons and Sawflies, as they are familiarly called, may be known by their mandibulate mouths, complete metamorphoses, their four membranous wings with branching nerves, enclosing a few comparatively large sized cells, or rarely almost nerveless, and by the form of the thorax, all the segments of which are exhibited dorsally. Some forms are wingless.

The Aculeata may be considered as the highest section of the order, both on account of the ingenuity displayed in their domestic economy and also of their more highly specialized organs. The antennæ as a rule are thirteen jointed in the male and twelve jointed in the female; there are three ocelli in the vertex of the head, and two large lateral compound eyes; these, however, are sometimes reduced to a single facet, or entirely absent. The abdomen is pedicellate, and the ♀ is armed with a sting, whose wound owes its painfulness to the poison ejected from its poison bag, but even this prominent character is not always present, the true *Formicide* being destitute of a sting. The sting is always retractile, and almost always hidden when withdrawn. In some few genera the ♂ is winged and the ♀ apterous, and in one or two exceptional instances the ♂ is apterous, but as a rule both sexes have fully-developed

wings. In the social groups a second form of the ♀ exists, in which the ovaries are not fully developed. Such females are generally called "workers," and in the *Heterogyna* or ants are always wingless. By social species is understood those of which many individuals combine in making a common nest. Of these there are three groups, the *Heterogyna* or ants, the *Vespidæ* or true wasps, and the higher *Apidæ*, which include the humble bees and the hive bee. All the rest are solitary, one ♀ making and provisioning its own nest. Many of the solitary species occur in colonies, and this habit of colonization is considered by some to be a tendency towards socialism. In general form the Aculeata may be said to vary comparatively very little, especially among the *Anthophila*. The specific characters are often most obscure, and frequently the females of two species are so alike that in the absence of the ♂ their real names cannot be assigned to them with certainty. The genera are more easily defined, but the difficulty of discovering characters by which to sort the genera into families or groups is very great. The males and females are often very dissimilar, and in some groups rarely occur together. The inquiline (or cuckoo) genera, of which there are many among the *Anthophila*, call for special notice. Their species inhabit the same nest or lay their eggs in the same burrows as the bees to whom the nests belong. They apparently do nothing towards the economy of the family into which they intrude, but lay their eggs so that their offspring shall have a better chance of nourishment when hatched than that of their hosts. Yet, notwithstanding this, they appear to live on friendly terms with the owners of the nests, and generally closely resemble them in appearance, although in a few cases the dissimilarity between them is very strongly marked. The inquilines, however, are always destitute of the specialized organs for pollen collecting which characterize their hosts.

The habits of the Aculeates are most diverse. All are believed to be vegetable feeders in the imago state, but in the larval state some feed on animal and some on vegetable substances. Some nest in the ground, some in bramble stems, some in gate posts; key holes and locks prove attractive to some; old disused snail shells to others; holes in walls are utilized by certain species, and so plastered up as to leave no suspicion of a hidden nest; whilst others make mud nests, and suspend them from a twig, or attach them to a stem of grass. The Carder bees belonging to the genus *Bombus* make a covering to their nests, which are placed on the ground, of moss, grass, etc., but some have been known to utilize a forsaken bird's nest. The habits of the various genera and species will be treated of under their respective heads. The metamorphoses of the Aculeata are complete; the pupæ, which are either naked or enclosed in a cocoon, are almost exactly of the form of the perfect insect, except that the wings are enclosed in short pad-like cases. The larvæ are pale, fleshy, and grub-like. A remarkable peculiarity exists in the transformations of these creatures. The first and part of the second segment of the larva unite to form the head of the imago, the fifth segment of the larva, which in other insects forms the first abdominal segment in the imago, is transferred during the insect's passage through its pupal conditions to the thorax, so that what looks like the metathorax in the imago is really formed partly of the first abdominal segment, and the constriction which follows it is really between the first and second segments of the abdomen, instead of between the abdomen and thorax. This transferred segment has been called the "*propodeum*," by Newman, the median segment by some authors; but, for convenience sake, I shall treat it here as part of the metathorax, and call the first segment of the abdomen that which follows the second regional constriction.

In position the Hymenoptera should probably be placed

at the head of the Insecta. Their economic and often social instincts tend to place them in this position, and their right to it is supported by their wonderfully specialized structure, the very strongly defined regional constrictions and the highly cephalized imago.

In the arrangement of the families I have followed the old plan, as it is quite impossible to get a satisfactory linear arrangement, and therefore I have not thought it worth while to disturb the existing one of our lists.

Fossil Hymenoptera.—The oldest known representatives of this order have been obtained from the Solenhofen State of Bavaria and the Purbecks of this country, both belonging to the Upper Oolite (Secondary Period), but the *Hymenoptera* do not appear to have been common and generally distributed until towards the middle of the Tertiary Period.

The remains of *Hymenoptera* are not uncommon in the middle and upper Eocene and the lower, middle and upper Miocene. In certain strata of middle Miocene age Professor Heer found the *Hymenoptera* more numerous represented than any other order of insects.

INTERNAL ANATOMY.

Digestive System.—The food passes through a groove at the back of the labium into an enlarged chamber which opens into the oral cavity, thence through the pharynx into the œsophagus, which runs as a narrow tube through the thorax, opening out at the base of the abdomen into an enlargement called the first stomach, honey sac, or crop. At the posterior end of this stomach is a constriction, or kind of mouth corresponding to the gizzard, which can be opened to let the food pass into the chyle stomach, or can be kept closed, so as to allow the contents of the crop to be regurgitated. Léon Dufour says that in the *Crabronidæ* there exists a lateral stomach or pouch leading out of the œsophagus, sometimes on the left hand side and sometimes

on the right, and varying considerably in form. Beyond this the œsophagus continues for a short distance as a narrow tube, and then dilates into the second or chyle stomach. The chyle stomach also receives the urinary vessels near its apex. Beyond the chyle stomach extends the smaller intestine which widens out posteriorly into the colon, which again narrows to the apical opening of the abdomen. The sides of the colon internally are usually strengthened by longitudinal plates varying in form and number, but in the genus *Bombus*, Dufour says there is no trace to be found of this character.

Salivary System.—The salivary glands in the Hymenoptera play a very important part in their economy, and in the hive bee are very largely developed. Some of these lie in the head, some in the thorax. The pharynx beneath is chitinized into a slightly concave plate called the hypopharangeal plate, near the front margin of which are two nipple-like openings, which lead into the salivary ducts, these diverge laterally into two systems of glands that lie near the centre of the head. Behind these are two other lateral systems in the head, and two more lying in the thorax; these latter four unite into one common duct, which terminates in a valvular opening near the base of the tongue on its upper surface. This description is taken from the ♀ of the honey bee; probably modifications of these systems would occur in many of the families. Léon Dufour fails to find any salivary glands in some of the *Fossors*. At the base of each mandible there is a small gland, but there seems to be doubts as to its functional use.

The Nervous System, as in other insects, consists of a system of ganglia united along the centre of the insect by two longitudinal cords, from which ganglia nerves are distributed to the various organs. The cephalic ganglia are largely developed; there are five or six abdominal ganglia, the rest being thoracic.

The Circulatory System consists of a dorsal vessel, which

lies along the back of the abdomen, from which the blood is circulated through the vessels by the contractions and dilatations of the organ.

The *Respiratory System* is carried on through the agency of spiracles, which open into the air tubes or tracheæ, which distribute the air through the system. These tracheæ consist of two main branches dilating towards the base of the abdomen into two very large vessels, which help the insect to sustain itself in the air.

The spiracles in the Aculeata are not easy to see, as those of the abdomen are mostly at the base of the segments hidden by the overlapping of the preceding one. That on the first abdominal segment is however exposed, and those of the metathorax and propodeum may be easily examined.

Reproductive System.—In the ♂ the organs of this system are, as in other insects, the testes, the spermatic ducts which lead from the testes into the seminal vessels, and the ejaculatory duct terminating in the intromittent organ. In some cases the testes are enclosed in a common sac; in others distinct. In some the spermatic ducts lead directly from the testes into the seminal vessels; in others the seminal vessels are at the ends of tubes which lead into the spermatic duct. In the ♀ the organs are the ovaries, each of which consists of a series of tubes united together at the ends, varying considerably in the different genera, the oviduct, the spermatheca and ejaculatory ducts. Amongst the social genera, where a worker form exists, its ovaries are less developed than in the ♀. The ♀ is supposed to be able to voluntarily control the passage of spermatozoa into the eggs, so that ♂ or ♀ eggs can be laid at will, those unimpregnated always producing ♂ offspring.

Before closing these short remarks on internal anatomy, I must mention two other important sets of organs in the ♀ and ♂, viz. the poison and wax-secreting organs. The former of these consist of a sac into which the secreting tubes enter, and which can empty its contents through the

canal of the sting. The latter, which only exist in the worker bees, consist of glands which secrete the wax from the blood, and from which the wax in a liquid state soaks through the abdominal wall, and is collected and cools on the ventral segments of the abdomen.

EXTERNAL ANATOMY.

The skeleton is hard and usually more or less shining and black, but yellow and red markings are frequent, and some species are entirely pale and testaceous. Many of the species of the Anthophila are very hairy, and in this section the hairs are plumose—at any rate those on the thorax—whereas in the other sections they are simple, or in some cases twisted.

HEAD large, but varying little in general form. The face is vertical or nearly so; the vertex usually convex and transverse, sometimes nearly quadrate. The *compound eyes* generally occupy a considerable portion of each side of the head, and are composed of many facets, although amongst the *ants* they are sometimes wanting, or are reduced to a single facet. Besides the compound eyes there are usually three *ocelli* on the vertex, arranged more or less in a triangle. The side of the face below and behind the eye is called the *cheek*. This varies much in length, and in some genera the eyes meet, or nearly meet, the mandibles. From each side of the face between the eyes spring the *antennæ*. These are as a rule thirteen jointed in the ♂, twelve jointed in the ♀ and ♀. The first joint, which is very long in the ants, is called the *scape*, and the remaining joints the *flagellum*. The *antennæ* in the Aculeates are mostly filiform, or very slightly thickened to the apex, but the basal joint is often much thicker than the others, the second almost always very short; in the ants the apical joints form a distinct club; the lower central portion of the face is nearly always divided from the upper, and often from the side portions by distinct impressed lines. The area thus limited

is called the *clypeus*. Just above this in the ants is a small triangular space called the *frontal area*. On to the front margin of the clypeus is hinged another piece or flap called the *labrum*; the *mandibles* articulate on to the cheeks at their apex, and vary very much in form and development, they fold across, below, or sometimes over, the *labrum*; under the labrum is the *epipharynx*. On the underside of the head is a deep wide groove into which the cibarial apparatus fits when at rest. The ceiling of this groove is the posterior side of the wall of the face; the sides of the groove are sub-parallel and nearly perpendicular, and unite posteriorly in a semi-circular curve, anteriorly the groove is free except when closed by the mandibles folding across it. Into the sides of this groove articulate the *cardines*, two narrow joints each slightly widened at the apex. On the widened apices of these swing the *lora*, which are two narrow joints united so as to form a Λ shaped body. These vary a good deal in length and width, and in some genera are wanting. From the centre of this Λ depends the *submentum*, a more or less triangular, sometimes hyaline body. This is followed by the *mentum*, which is semi-tubular, and forms a sheath in which lie some of the softer parts of the apparatus. From each side of the apex of the *mentum* spring the *labial palpi*, whose joints may be either cylindrical or sheath-like, and from between them extends the *ligula* or *lingua*. The ligula itself is grooved posteriorly, and its anterior surface is traversed by very fine ridges set with bristly hairs. In the higher *Apidæ* there is a ladle-like organ, or "*bouton*" at the apex. The *ligula* may be short and bifid at the apex, as in the *Fossores*, ants and wasps, and the early genera of the *Anthophila* called the *obtusilingues*, or short, wide, and pointed, as in the genera *Halictus*, *Andrena*, etc., or many times longer than wide, as in the higher *Apidæ*. The upper side of the base of the *ligula* is ensheathed by the *paraglossæ*, which vary much in shape and size. All the central or labial organs are laterally ensheathed by the *maxillæ*, which articulate to the widened apices of the

cardines just outside the articulation of the arms of the *lora*. The *maxillæ* are sheath-like organs, each emitting near its centre laterally a *pulpus* called the *maxillary palpus*, the number of whose joints varies greatly in the different genera; two narrow sclerites, called the *sclerites of the hypopharynx*, extend from the oral groove, close to the articulation of the *cardines*, down to the base of the *mentum*, passing between the *maxillæ*, to whose basal membrane they appear to be attached. In many genera from its point of attachment springs a scale-like organ of variable shape frequently fringed with bristly hairs. Between all the sclerites and organs at the base of the cibarial apparatus extends a membrane limited anteriorly by the *sclerites of the hypopharynx*, the investing membrane forming a complete bag.

The whole apparatus can be folded up and packed away in the oral groove thus:—The blades of the *maxillæ* in the higher *Apidæ* fold back on to their stems, the *lora* fold back between the *cardines*, and the *cardines* are drawn up into the groove, so that their distal extremities point backwards. In the short-tongued bees there is no folding of the *maxillæ* on themselves, so that the point of the tongue when folded up is anterior.

THORAX.—This, as in other insects, is composed of three segments—the *prothorax*, *mesothorax*, and *metathorax*—but added to the last of these is the basal segment of the abdomen or *propodeum*. The dorsal surfaces of these segments are called respectively the *pronotum*, *mesonotum*, and *metanotum*; the sides the *pro*, *meso*, and *meta pleuræ*; the ventral surfaces the *pro*, *meso*, and *meta sterna*. The *prothorax*, as a rule, is very short, and often is only represented dorsally by a sort of rim-like collar; its sides, however, generally extend nearly to the insertion of the wings, where they terminate often in a raised tubercle. In the ants and the *Pompilidæ* the *pronotum* is more elongate, not raised, and its posterior margin largely emarginate. In the *Anthophila* the *pronotum* is short, but not generally raised or gibbous; the

prosternum receives the front pair of legs. In the *mesothorax* the *notum* or *scutum* is largely developed, as well as the *pleuræ*; the *scutellum* is variable in size, and situated behind it. Very important characters lie in the sculpture of the *meso-notum* and *mesopleuræ*; the *mesothorax* bears the first pair of wings, the extreme base of which are covered by two little concave plates called the *tegulæ*, and the second pair of legs. The *metathorax* proper is short, its summit forming the *postscutellum*, but behind the *postscutellum* is often another strip widening laterally into a triangular pleural expansion; this segment bears the posterior wings and legs; behind this is the *propodeum* which varies much in form, in some of the ants and in the genus *Nysson* it bears spines, but as a rule it is rounded posteriorly; it often bears at its base an enclosed area, which affords valuable characters; in fact, the sculpture of the *metanotum*, *metapleuræ* and *propodeum* is generally of high specific importance.

The wings are membranous, and vary much in their neurulation, the arrangement of which is often of great value for classificational characters. There are in the anterior wings four main nervures extending from the base towards the apex: the *costal* nervure, which forms the anterior margin of the wing, the *postcostal*, which runs close and parallel to it; the *median*, which is situated about the middle of the wing; and the *posterior*, which lies between this last and the posterior edge of the wing. The *costal* and *postcostal* nervures terminate in the *stigma* a dark incrustation on the anterior margin of the wing, beyond which is the *marginal* cell enclosed by the *marginal* nervure, which in rare cases has an appendix. From the apex or sometimes nearer the middle of the *postcostal* nervure is emitted a transverse nervure called the *upper basal* nervure. This connects the *postcostal* with the *median*; the *median* is connected with the *posterior* by another transverse nervure called the *lower basal* nervure. These two transverse nervures are often united. The cells enclosed by these basal

nervures, one between the *postcostal* and the *median*, and the other between the *median* and *posterior* nervures, are called the *upper* and *lower basal cells*. These cells exist in nearly all our British genera. From this transverse or *basal* nervure, as it crosses the upper basal cell, extends a nervure towards, but rarely attaining to, the apical margin of the wing. This, which is called the *cubital nervure*, is united by one or more transverse nervures to the posterior nervure of the *marginal* cell, enclosing thereby one, two, or three cells called the *sub-marginal cells*.

The cubital nervure emits posteriorly two others called the *recurrent nervures*. The basal one of these unites it with the *median*, forming the *first discoidal* cell. A nervure running from this point of union to the posterior nervure creates another cell, called the *second discoidal*. From the centre of this cell's outer nervure, a longitudinal nervure is emitted, which meets the second *recurrent*, thus forming a cell called the *third discoidal*. From the extero posterior angle of this cell a nervure sometimes extends to the apical margin of the wing. When this is so two more cells are formed, called the *first* and *second apical cells*; some of these cells, especially those on the posterior apical portion of the wing, are frequently wanting.

In the posterior wings there are three main longitudinal nervures—the *anterior*, which runs nearest to the anterior margin, the *median* and the *posterior*. The *anterior* is sometimes united to the actual anterior margin of the wing near its centre, and is nearly always united by a cross vein to the *median*, which again is usually united by a cross vein or a curved nervure to the *posterior*. On the front margin of the posterior wing is a series of fine hooks, by which the wing can be hung on to the anterior one. The wings are nearly always hyaline, but occasionally dusky, and in *Psithyrus rupestris* ♀ nearly black.

The legs are each composed, as in other insects, of *coxa*, which is usually large and swollen; *trochanter*, which is, nearly always single, but in a few genera of the *Fossors*

double, *femur*, *tibia*, and *tarsi*. On the front leg is a beautiful arrangement for cleaning the antennæ, &c., the spur or *calcar* at the apex of the tibia is modified so as to form a sort of razor or knife-like organ, varying much in form, with a sharp edge on its inner side, which fits against a semi-circular emargination in the basal joint of the tarsi, set with fine teeth like those of a comb. The antennæ can be passed between these organs and so cleaned. I have frequently watched a wasp thus performing her toilet. The hairs near the apex of the front tibiæ are also frequently modified, having knife-like edges, evidently also for cleansing purposes. The tarsi are usually five-jointed, and are occasionally much dilated and modified. The intermediate legs have usually two *calcaria* at the apex of the tibiæ, and in a few cases the femora near the base have a dense row of spine-like hairs beneath; the posterior legs are very subject to variability in form; in the *Anthophila* they frequently carry the pollen collecting apparatus, and their tibiæ are usually more or less dilated and densely clothed with hairs; in *Bombus* they are very smooth outwardly, with a series of long curved hairs on each edge, which serve as a basket to carry the pollen, and are also occasionally used to carry mud or clay; the sides of the tibiæ towards the abdomen are densely clothed with short hairs with dilated apices with sharp edges like spades, doubtless used for cleaning off the pollen grains, &c. The posterior tibiæ have usually two *calcaria*, but in the genus *Apis* they have none. The tarsi have the basal joint more or less dilated in the *Anthophila*; the *unguiculi* are usually well developed and often toothed, and the *pulvillus* in some of the fossorial genera is very large. Special male characteristics are of frequent occurrence in the legs of the *Aculeata* which do not occur in their respective females.

ABDOMEN—this is usually oval, but sometimes elongate, and occasionally nearly round. There are usually seven segments visible dorsally in the ♂, and six in the ♀, ventrally there is usually one segment less visible, but the

eighth occasionally protrudes beyond the apex of the sixth, as in the ♂ of *Pompilus*, *Andrena*, &c., where although the seventh is hidden, the eighth forms the visible apical segment. The posterior opening as a rule is apical, but in some genera such as *Megachile* *Osmia*, &c., it is inferior, and in these cases several of the ventral segments of the abdomen are "telescoped" up as it were, and hidden under the preceding segments. The eighth segment in most of the genera is hidden, but it can nearly always be dissected out; it generally clings closely to the genital armature in the ♂, and some authors have more or less confounded it therewith. In some genera the eighth dorsal segment in the ♂ bears two small palpiform organs, called penicilli. The terminal segments and the genital armature in the ♂ afford most valuable characters. The latter organ consists of two pairs of forceps, the outer ones or *stipites* springing from a basal ring called the *cardo*; the inner ones are called the *sagittæ*, and lie between the *stipites*. Over these at the base lies the *spatha*, and between these can be exerted the intromittent organ. These two pairs of appendages probably denote the existence of a tenth and eleventh abdominal segment, and probably the *cardo* and *spatha* are vestiges of the original somites; the apical portion of the *stipes* is often dilated and modified in the *Anthophila*, and has received the name of the *lacinia*. In the genus *Apis* the ♂ armature is quite different to that of any other genus, the *stipites* being wide and triangular, and the *sagittæ*, probably being internal and represented by what is called the "bean," i.e. the plates which protect the *spermatophore*. I can see nothing in any other genus to correspond to the *pneunophyses* of *Apis*. For further remarks on the terminal male segments of the Aculeata I may refer to the "Transactions of the Entomological Society," 1884, p. 251 *et seqq.*, where I have gone into the subject at greater length than I am able to do here.

In the ♀ the abdominal segments are nearly always simple, except the dorsal valve of the sixth, which is often

characteristic in sculpture or form. Some genera have the pollen carrying apparatus on the ventral segments of the species, these being densely clothed with hairs; these genera have been collected into a family called *Dasygastræ* or *Gastrilegides*. The sting consists of a sheath and two darts, the darts being grooved so as to fit on to two longitudinal carinæ, whose transverse section is shaped somewhat like the rail of a railroad which extend along the sides of the groove of the sheath. By this arrangement the darts can move up and down along the groove, and yet retain their position parallel to it. The actual incision when a bee stings is made by the sheath, but it is deepened by the darts which can be projected beyond its apex. The poison passes down the groove of the sheath, which is closed by the darts; both darts and sheath are more or less serrate near the apex. At the base the darts and sheath are prolonged laterally into two curved sclerites, which terminate in what Lacaze Duthier calls the "*ecailles*." These more or less embrace the base of the apparatus, and vary very much in their shapes and the form of their attachments.

COLLECTING.

This requires more care and observation than in most orders, and can only be followed satisfactorily if the sun is shining, as on a cloudy day the Aculeates, except the social species, rarely come out. From 9 a.m. to noon or 1 p.m. is about the best time. After this they are certainly rarer, especially the ♀. The insects are mostly active, some excessively so. One of the chief difficulties is to secure the males of some of the species. These are apt to fly about very rapidly, rarely settling, and it requires good eyesight and quick action to catch them while on the wing, whereas to wait till they settle would mean losing hours of time over a few captures. I generally use a very small gauze net, the ring of which is about seven inches in diameter. This, on a short stick about two feet long, is, I believe, the

most useful weapon. It is easy enough to catch those species which visit flowers, and settle on them; but such insects as the *Pompilidæ* require most careful stalking, as they run and jump and fly most rapidly when frightened. The best way to get them when on the ground is to put the net over them suddenly, hitting the ground pretty hard with the ring. This will often make them jump upwards, and then with one's hands one can grasp the net above the ring; otherwise they will keep on the ground and run out under the ring, or else lie quite still till one raises the net to look and then fly off. In killing the *Hymenoptera*, as in the *Hemiptera*, it is essential not to wet their wings. I always use an ordinary collecting bottle and cyanide, with paper so arranged that the bees do not touch the dampness. This makes the wings stiff, but if any one wishes to set his captures with the wings extended, they can easily be relaxed with laurel leaves.

I find the best way to prepare specimens for examination is to mount them across very short narrow strips of card. Of course, the very large ones must be pinned, but the pins are very apt to corrode. Care should be taken to extract the ♂ armature, which can easily be done with a setting needle. Sandy localities are usually the most promising for Aculeates, but other districts also have their specialities. In the early spring months, say the middle or end of March, the first Aculeates generally appear, humble bees and wasps showing first. The *Andrenas* then commence, and frequent chiefly the blossoms of *Salix*; after *Salix* is out of flower, dandelions and other yellow composite plants are always favourites. As the summer approaches most flowers are attractive, but especially thistles, composites, bryony, blackberry, *Potentilla*, clover. Some species confine themselves to one special flower; others seem to be indifferent in these matters. The long-tongued bees, however, except the social species, which visit almost any plant, as a rule frequent tubular flowers. The best months for the *Possorial Hymenoptera* are July and August; after the

beginning or middle of *October* there is hardly anything to be found in this country.

DIVISIONS.

The Aculeates can be divided in four large sections by the following characters :—

- | | | |
|--------|---|-------------|
| (6) 1. | Hairs not plumose or branched, basal joint of the hind tarsi not dilated. | |
| (5) 2. | Wings, when at rest, not folded longitudinally. | |
| (4) 3. | Petiole of the abdomen, with one or more scales or nodes, species social | HETEROGYNA. |
| (3) 4. | Petiole simple, species solitary | FOSSORES. |
| (2) 5. | Wings, when at rest, folded longitudinally | DIPLOPTERA. |
| (1) 6. | Hairs plumose or branched, at least those of the thorax, hind tarsi with the basal joint more or less dilated | ANTHOPHILA. |

HETEROGYNA.

This section is composed of the ants, whose habits and instincts place them very high in the scale of insect life. They nearly all form communities, consisting of ♂ ♀ and ♀. The ♂ and ♀ are almost always winged and the ♀ apterous. The abdomen is constricted at the base, its first or its first and second segments either being modified into nodes, or the first segment bearing an upright transverse scale. The anterior tibiæ have an internal cavity into which one of the tracheal vessels enters. This is thought to be an auditory organ. Several ♀ often inhabit the same nest; the winged forms swarm out of the nest on a suitable day, generally on one which is very hot and sultry. Impregnation having taken place, the ♀ sets to work either alone or with such workers as she can attract to found a nest for herself. The larvæ depend entirely on the ♀ for their food, which consists of honey regurgitated. The form of nest varies very much. Some ants make nests above the ground of fir needles, bits of wood, leaves, &c., as *Formica rufa*, &c. Others, as a rule, are subterranean, as *F. fusca*; others again, as a rule, select tree trunks as *Lasius fuliginosus*; others go under stones to

nest, some, like *Lasius flavus*, often make "ant-hills," but at other times retreat under a stone and make their galleries there. I have no room to enter into any lengthy account of ant habits, as the ants are perhaps the most wonderful of any insects, and their habits would fill more pages than can be possibly given to them here; but I must mention one or two points in which they seem to differ from those of any other *Hymenoptera*. In their nests are to be found various beetles, ants of other species than the maker of the nest, a species of wood louse, various *Aphides*, and other *Hemiptera*, &c. Some of these are never met with anywhere except in or near ants' nests, and their relations to the ants have long been a puzzle to naturalists and remain so; that they are not objectionable to the ants, seems clear, but of what use they are is still obscure. Some insects, such as the *Aphides*, are evidently brought in by the ants, and kept for the saccharine matter which they emit, but the myrmecophilous beetles hardly seem likely to afford much enjoyment to the ants in this way, although in the case of *Claviger* and other beetles which have tufts of hair, the ants have been seen licking these hairs as if some pleasure were obtained from the process, also the ants have been seen to feed them. At any rate, these beetles exist in ants' nests, some of them, like *Claviger*, absolutely blind; many of them so like the ants themselves in colour and movements, as to be hard to distinguish from them when moving about together. Some nests seem to abound in beetles, other have none or scarcely any.

Formica sanguinea actually makes slaves of *F. fusca* and its race *cunicularia*, going out and stealing the ♀ pupæ from the parent nest; but besides those who have been thus kidnapped, there are species which live with others in relationships at present unknown, as for instance *Formicoxenus* and *Formica rufa*. No one has found a nest of the former, but it may frequently be found with *rufa*, and has never occurred elsewhere; it has the eccentricity also

of having an apterous male. Another wonder in ant life, which has not yet been recorded as occurring in Britain, is the relationship existing between *Tetramorium cæspitum*, and a most curious ant, *Anergates atratulus*, the ♂ of which is apterous, pale, and almost larva-like, and the ♀ winged with a more or less flat body, which has a great depression down the middle as if it had been squashed, but which becomes extended, like that of the Mexican honey-pot ant, when full of eggs. This extraordinary pair have no workers of their own, and depend on *Tetramorium* to supply their needs. *Tetramorium* is common enough in this country, and possibly *Anergates* may some day turn up here also.

The duration of life in the ♀ and ♂ of *Lasius niger* according to Lubbock has been known to extend to six or seven years.

TABLE OF FAMILIES.

- | | | |
|--------|---|------------|
| (4) 1. | Petiole with a single transverse scale or node. | |
| (3) 2. | Abdomen not constricted between the second and third segments, ♀ and ♂ without a sting, or with only a rudimentary one . | FORMICIDÆ. |
| (2) 3. | Abdomen constricted between the second and third segments, but not sufficiently to modify the second segment into a node. ♀ and ♂ with a well developed sting . | PONERIDÆ. |
| (1) 4. | Petiole with two nodes | MYRMICIDÆ. |

FORMICIDÆ.

Of this family we have only four British genera, one of which, *Prenolepis*, has only occurred here in a single ♂ example. The chief characteristics of this family are the flat elevated scale on the petiole, which however, in the genera *Prenolepis* and *Tapinoma* is decumbent, and in *Tapinoma* is not actually distinguishable from the petiole itself, and the absence of a developed sting in the ♀ and ♂. In *Formica* the ♂ and ♀ are about equal in size, in *Lasius* the ♀ is much larger than the ♂. The species of the various genera are very closely allied, and several of the forms which used to be considered as species are now treated as races.

- (6) 1. Five segments of the abdomen visible above in ♂ and ♀. Apical segment conical, and its opening ciliated, apical and circular. Poison bag with a cushion above, sting entirely transformed into a support for the mouth of the bag. ♂ with the calcaria of the middle and hind legs simple.
- (5) 2. Scale of the petiole erect.
- (4) 3. ♂, first joint of flagellum, not thicker than the rest. ♀ and ♀ with the second to fifth joints of the flagellum longer than those at the apex, and the frontal area very distinct FORMICA.
- (3) 4. ♂, first joint of flagellum much thicker than the rest. ♀ and ♀ with the second to the fifth joints of the flagellum as short as or shorter than the apical ones, and the frontal area indistinct LASIUS.
- (2) 5. Scale of the petiole not erect PRENOLEPIS.
- (1) 6. Four segments of the abdomen only visible from above in the ♂ and ♀, the fifth being hidden under the fourth, orifice wide and transverse, inferior, not ciliated, poison bag without a cushion, sting rudimentary. ♂ with all the calcaria serrate TAPINOMA.

FORMICA, Linn.

♂ and ♀ about equal in size, workers variable, the ♀ major often half as large again as the ♀ minor. ♀ and ♀ without stings; maxillary palpi six-jointed; antennæ thirteen-jointed in the ♂, twelve in ♀ and ♀, mandibles comparatively feeble in the ♂, wide and triangular in the ♀ and ♀, much narrowed at the base; thorax subovate in the ♂ and ♀, constricted in the middle in the ♀, upper wings with two submarginal, and one discoidal cell; petiole with an erect flattened scale; pupæ generally enclosed in silken cocoons. Forel says that the workers do not follow in line over unknown ground, but that they frequently carry one another, the one carried being rolled up under the head of the carrier. We have four of the six European species in this country.

- (2) 1. Vertex of the head emarginate, petiole scale deeply notched EXSECTA.

- (1) 2. Vertex not emarginate, petiole scale not deeply notched.
 (4) 3. Clypeus emarginate SANGUINEA.
 (3) 4. Clypeus not emarginate.
 (6) 5. Frontal area polished in ♀ and ♂. Eyes in ♂ more or less hairy, abdomen ovate ♂ . . . RUFA.
 (5) 6. Frontal area dull in ♀, ♂. Eyes in ♂ naked, abdomen elongate FUSCA.

F. rufa, Linn. (*pratensis* De Geer, *congerens* Nyl.)

Surface clothed with scattered fine short hairs. Head dull, black-brown, mandibles untoothed, eyes hairy; thorax black-brown, dull, except the scutellum and propodeum, wings clouded with brown at the base, nervures pale; abdomen black-brown, widest at the base, slightly shining, surface indistinctly punctured, and genital armature testaceous; legs testaceous varying to darker.

♀ head dull, brown, testaceous red at the sides; thorax red, brown on the mesonotum and scutellum, dull except the scutellum which is shining, wings clouded at the base; abdomen, shining, very convex and shortly elliptic, its apex and underside sparsely pilose; legs red, clouded with brown.

♂ Entirely dull, except the frontal area and mouth parts; head red, widest posteriorly, vertex and face above the antennæ brown, vertex convex, clypeus entire, with a dark keel down the centre, antennæ brown; thorax red, sometimes more or less dark above; abdomen beyond the petiole nearly round, brown-black, clothed with very fine grey pubescence, petiole red; legs reddish-brown, the coxæ red.

L. ♂ ♀ 10-12 mm., ♂ 6-10 mm.

Race, *pratensis* De Geer (*congerens*, Nyl.), differs from the typical form, in having the eyes more densely hairy between the facets, being hairy even in the ♀ and ♂, and in having the thorax more hairy in the ♂. The abdomen above with sub-erect hairs in the ♂ and its surface dull and finely pubescent in the ♀.

Common in sandy localities where fir woods exist. Generally forming large dome-shaped nests on the ground, but occasionally in the hollow stem of an old tree; the ♂

and ♀ leave the nest about midsummer. This year (1893) the ♂ and ♀ have been taken early in May. *Formicoxenus nitidulus*, Nyl., one of the *Myrmicidæ*, associates with it, and it also harbours in its nests many species of myrmecophilous *Coleoptera*; the race *pratensis* is rare in this country, but has been recorded from Bournemouth and Rannoch.

F. sanguinea, *Ltr.*—Somewhat like *rufa*, but brighter in coloration; the ♂ has the mandibles with four to five teeth, the clypeus emarginate anteriorly, and the legs of a brighter paler red.

The ♀ and ♂ differ from *rufa* in having the red colour paler, brighter and more extensive, the frontal area dull, the clypeus emarginate and scarcely carinated, and the abdomen in the ♀ clothed with fine short pubescence.

L. ♂ ♀ 9–10 mm., ♀ 5–9 mm.

The ♂ and ♀ leave the nests about midsummer.

Chobham; Woking; Weybridge. Hawley, Hants; New Forest; (*Smith*). Shirley; (*Rothney*). Wellington College; (*W. F. White*).

One of our most interesting ants, as it makes "slaves" of *Formica fusca* and its race *cunicularia*, and many other species are occasionally found in its nests; these are generally made on banks and are less symmetrical than those of *rufa*, and as far as I have seen less elevated. G. A. J. Rothney takes *Leptothorax acervorum* in and about the nests of this species, but the relationship between them is not certain.

F. exsecta, *Nyl.*—Another red species very like the two preceding in general colour, but very distinct in form; the vertex of the head is widely emarginate and the scale of the petiole is deeply notched above in all the forms, and in the ♀ and ♂ the eyes are smaller and further removed from the vertex, and the sides of the head behind the eyes converge posteriorly, the surface of the ♀ is dull throughout, except that of the scutellum.

L. ♂ and ♀ 7–8 mm., ♀ 6–8 mm.

Rare, has only occurred so far as I know at Bourne-mouth and Parkstone, where it makes nests somewhat like those of *rufa* but much smaller, and frequently on the open heath. Swarms about midsummer.

F. fusca, Latr., (race *rufibarbis*, Fab. = *cunicularia*, Ltr.; race, *gagates*, Ltr.).

♂ Elongate, dark black-brown; eyes not hairy, vertex of head convex, clypeus entire; thorax without semi-erect hairs above, wings slightly clouded, legs. and genital armature testaceous.

♀ and ♂ entirely bronzy-brown, or with the front of the face, the sides of the thorax and apex of the propodeum, and scale of the petiole in the ♀, or the entire thorax in the ♂ red, as well as the antennæ and legs in both sexes; the bright coloured specimens belong to the race *rufibarbis*, but forms intermediate in colour occur, which are difficult to assign to either race for certain; general surface and that of frontal area dull in the ♂, except in the race *gagates*, surface shining or dull in the ♀, abdomen clothed with fine sheeny pubescence in ♂ of *fusca* (type), dull and with a few erect hairs in the race *rufibarbis*, shining with pale hairs near the apex of each segment in the race *gagates*.

L. ♂ ♀ 8-10 mm., ♂ 5-8 mm.

The typical form of this species is usually common. *rufibarbis* is more local but widely distributed; of *gagates* I have only seen a single British ♀ from Smith's collection, without note of locality; it is smaller and paler than Continental *gagates*, although agreeing with it in other characters. This species usually nests under ground, but rarely in stumps of trees—the ♂ and ♀ swarm about August. Several myrmecophilous *Coleoptera* occur with this species.

LASIUS, Fab.

Characters of *Formica*, but ♂ and ♀ about equal in size, ♀ much larger. ♂ varying very little in size, legs shorter

than in *Formica*, basal joint of the flagellum swollen in the ♂, the second to fifth joints of the flagellum in the ♀ and ♂ as short as, or shorter than, those at the apex. Forel says that the workers follow one another in line, but never carry each other. We have all four of the European species in this country, although several of their races do not occur with us; pupæ always enclosed in a cocoon.

- | | | | |
|-----|----|---|--------------|
| (2) | 1. | Jet black, ♀ and ♂ very shining . . . | FULIGINOSUS. |
| (1) | 2. | Brownish, or yellowish, ♀ and ♂ not very shining. | |
| (4) | 3. | ♂ with the mandibles five-toothed; ♀ with the head wider than the thorax, wings very dark at the base; ♀ testaceous, its tibiæ generally with exserted hairs; scale of the petiole high | |
| (3) | 4. | ♂ mandibles one-toothed, ♀ with the head much narrower than the thorax, ♀ either pale without exserted hairs on its tibiæ, and with the scale of the petiole low, or brown, tibiæ with or without exserted hairs. | UMBRATUS. |
| (6) | 5. | ♂ and ♀ with the wings clouded at the base, ♂ with the forehead not channelled, ♀ pale yellow . . . | FLAVUS. |
| (5) | 6. | ♂ and ♀, wings clear, forehead of ♂ with a narrowly impressed channel below the ocelli, ♀ brown . . . | NIGER. |

L. fuliginosus, *Ltr.*.—Jet black, shining, head widely excavated posteriorly; antennæ and legs more or less piceous.

♂ head dull, antennæ pale towards the apex, thorax with a few indefinite punctures, and scattered hairs, wings slightly dusky at the base, abdomen shining.

L. 4–5 mm.

♀ and ♀ very shining, head and thorax, especially in the ♀, clothed with short hairs, wings in the ♀ dusky towards the base, abdomen with a few pale hairs at the apices of the segments.

L. ♀ 6 mm., ♂ 3–5 mm.

Generally distributed, nests in trees or old posts, rarely

in banks; many myrmecophilus beetles associate with it. The walls of its galleries are formed of a substance made of small bundles of woody fibre glued together by a liquid emitted by the mandibular and metathoracic glands, which are peculiarly developed in this species. It swarms in July and August, and gives off a most pungent aromatic smell.

L. umbratus, *Nyl.*, (race *mixtus*, *Nyl.*).—♂ and ♀ dark chocolate-brown, legs and antennæ paler, head as wide as or wider than the thorax; ♀ flavous; ♂ mandibles with five teeth; wings smoky from the base to beyond the middle, their nervures and stigma dark; abdomen clothed with fine semi erect hairs, scale of the petiole very slightly notched above.

♀ much larger than the ♂, somewhat shining, clothed with fine sheeny pubescence; mesonotum somewhat flattened, wings very dark at the base; abdomen not much wider than the thorax, scale slightly notched; tibiæ with erect hairs.

♀ entirely flavous, clothed with erect hairs, no trace of ocelli, scale of the petiole high, slightly narrowed towards the apex which has a slight notch; tibiæ with erect hairs.

L. ♂ 3-5 mm., ♀ 7 mm., ♀ 3-5 mm.

Race *mixta* differs from the typical form in having the head rather narrower, and the tibiæ in the ♀ and ♀ without exserted hairs. Generally distributed but less common than *flavus*. Nests usually underground, but have been noticed in decaying wood, and the Rev. W. F. White says that this species has been found by him in the stem of a plant of *Weigelia rosea*, in which it had carved out its own chambers and corridors. Swarms in August and September.

L. flavus, *De Geer*.—♂ head narrower than the thorax, and the mandibles with only one terminal tooth, forehead without a distinct channel; wings with the nervures and stigma pale, only very slightly clouded near the base.

♀ head narrower than the thorax; wings slightly clouded at the base; abdomen much wider than the thorax; tibiæ without exserted hairs.

♂ very like that of *umbratus* but generally smaller, and always without exserted tibial hairs; from race *mictus* it can only be distinguished by the shorter scale of the petiole which is widest above, and usually by its less hairy surface.

L. ♂ 3-5 mm., ♀ 7-8 mm., ♀ 2-4 mm.

Very common and generally distributed, makes its nests under stones or in hillocks. Swarms in August.

L. niger, Linn, (race, *alienus* Först.)—♂ and ♀ exceedingly like *flavus*, but the ♂ has a distinct deep narrow channel extending from the central ocellus to between the antennæ, and both sexes have the wings entirely clear and hyaline, tibiæ of the ♀ in the typical form with exserted hairs.

♂ differs from either of the preceding by its brown colour, which although often pale, never becomes flavous, and by having at least traces of ocelli.

L. ♂ 3-5 mm., ♀ 7-8 mm., ♀ 2-4 mm.

Race *alienus* only differs in having the tibiæ without exserted hairs, and in the ♀ by having the costal area infuscate.

This, which is our common garden ant, makes its galleries underground or more rarely in decaying wood; met with rarely in houses; swarms in July and August.

PRENOLEPIS, Mayr.

Of this genus we have only one British representative, of which only a single ♀ has been discovered. The ♂ and ♀ are exceedingly rare on the Continent; and the ♀ only occasionally met with. It may be known from either of the preceding genera by the absence of the erect scale of the petiole, and from *Tapinoma* by the scarcely emarginate anterior margin of its clypeus; very little is known of the habits of this genus.

P. nitens, Mayr. (*Tapinoma polita* Smith.)—"♀ rufo-testaceous, smooth and shining; head elongate, with a few scattered long hairs, and slightly emarginate behind; the scape as long as the head; the flagellum about the same

length, the two apical joints slightly thickened; thorax narrowed behind, and slightly strangulated between the meso- and metathorax, the latter emarginate behind, with the lateral angles rounded; scale decumbent, rounded above; abdomen ovate, sprinkled with a few long hairs."

L. 4 mm.

The above is a copy of Smith's description, as I have never seen the actual specimen described from.

Bournemouth, *J. C. Dale*.

(*Prenolepis longicornis*, *Latr.*—The Rev. W. F. White says that this species has existed in a large colony in a rectory in the City for years; it has also occurred at the Crystal Palace, Exeter, Hastings, and in the tropical houses at Kew Gardens. It may be known by its very long slender legs, with which it runs at an extraordinarily rapid pace. It cannot however be considered in any way as a native.)

(*Plagiolepis flavidula*, *Reg.*—An exotic species introduced into some of the hot houses at Kew and Cambridge. The ♀ is exceeding small and yellow, and may be known by its eleven-jointed antennæ, and its bright shining surface.)

TAPINOMA, Foerst.

A genus easily known from its allies by the sharp notch in the anterior margin of the clypeus. It really belongs to a distinct tribe of the *Formicidæ*, called the *Dolichoderidæ* of which it is the only British exponent. This tribe differs from the *Camponotidæ* to which our other three genera belong, in having only four segments of the abdomen visible from above beyond the petiole, in the ♀ and ♀, and also in having the aperture inferior and transverse, not apical and round as in the *Camponotidæ*; in the ♂ all the calcaria are serrate. ♂, antennæ thirteen-jointed, ♀ and ♀ twelve, labial palpi, four-jointed, maxillary six. There is only one European species. It makes its nest underground

or under stones; it does not appear to harbour *Aphides*, but one of our very rarest *Coleoptera*, *Myrmedonia plicata*, has been found in its nests.

T. erraticum, *Latr.*—♂ dark black brown, eyes situated about mid-way between the base of the head and the apex of the mandibles; vertex somewhat quadrate, antennæ very long, joints of the flagellum sub-equal; wings hyaline, nervures pale; abdomen with a few scattered hairs above, segments fringed beneath, apical one deeply emarginate, genital armature very large, dark like the rest of the body; legs paler, tibiæ clouded in the middle.

♀ about the same length as the ♂, but wider and flatter, thorax very flat above.

♀ much resembling a very black shining *Lasius niger*, but the eye is placed much further from the back of the head, and the notched clypeus and the absence of the petiolic scale will distinguish it at once. The entire surface is clothed with very fine adpressed hairs; the tibiæ are without exerted hairs.

L. ♂ ♀ 5-6 mm., ♀ 3-4 mm.

Common in some localities, preferring dry heaths, ♂ and ♀ appear about midsummer. Bournemouth; Chobham; Weybridge. Guildford; Coombe Wood; Shirley, and near Croydon; Wareham; Land's End; Scilly; (*Dale*). Bovey, South Devon; (*Biggell*).

PONERIDÆ.

Of this family we have only one genus in this country. The following are the characters of the family, scale of the petiole thick and upright, a constriction between the second and third abdominal segments; sting well developed, eyes very small in the ♀ and ♀, ocelli and sometimes the compound eyes absent in the ♀. Pupæ always enclosed in a cocoon.

PONERA, Latr.

Head transverse in the ♂, sub-elongate in ♀ and ♀, antennæ filiform and thirteen-jointed in the ♂ clavate and twelve-jointed in the ♀ and ♀, ocelli and compound eyes large in the ♂, small in the ♀, the former absent in the ♀, and the compound eyes present but exceedingly small in both of our British species. Maxillary palpi in the ♂ four-jointed, labial palpi three-jointed; in the ♀ and ♀ maxillary palpi one to two-jointed, labial palpi two-jointed, mandibles narrow with blunt apices in the ♂, broad and triangular in the ♀ and ♀; wings with two submarginal cells; abdomen constricted in all the forms between the second and third segments; apex of abdomen in the ♂ simple or with a down curved spine on the dorsal valve; legs slender in the ♂ and the tarsi very long, rather robust in the ♀ and ♀. We have two species of the four recorded from Europe.

- (2) 1. Apical dorsal valve of ♂ with a down curved spine, surface of the head in the ♀ and ♀ dull, and with the eyes small, not nearly touching the base of the mandibles, ♀ puncturation distinct . . . CONTRACTA.
 (1) 2. Apical dorsal valve of ♂ simple, surface of head in ♀ and ♀ somewhat shining, ♀ eyes large, nearly touching the base of the mandibles, ♀ puncturation so exceedingly fine and close as to be scarcely distinguishable PUNCTATISSIMA.

P. contracta, Latr.—♂ black brown, shining, antennæ and legs piceous; antennæ very long, reaching to about the middle of the abdomen; wings hyaline, apical spine of the abdomen pale.

♀ and ♀ pale piceous, head darker, legs testaceous; head dull, the puncturation exceedingly close; maxillary palpi two-jointed; thorax and abdomen somewhat shining, abdomen clothed with scattered pale hairs, more abundantly towards the apex, puncturation fine but not very close;

eyes exceeding small in the ♀, not nearly touching the mandibles in the ♀.

L. ♂ ♀ 3-4 mm., ♀ 3mm.

Rare; Brighton; Merton; (*Dr. Power*). Weybridge; (*Billups*). Shiere; (*Dr. Capron*). Near Liverpool; (*B. Cooke*). Deal; (*C. W. Dale*). Ventnor; (*J. C. Dale*). Plymouth; (*Reading*). Exeter; (*Parfitt*).

Very little is known of the habits of this species, it forms quite small colonies and nests under ground.

P. punctatissima, *Roger (=tarda Sm.)*—Very like *contracta*, but easily recognized in both sexes.

♂ with the apical dorsal valve of the abdomen simple, scape of the antennæ almost as long as the second joint of the flagellum, and the body less shining.

♀ and ♀ darker than those of *contracta*, maxillary palpi only one-jointed, head somewhat shining, exceedingly finely punctured, puncturation throughout finer and closer than in *contracta*; eyes in the ♀ larger and almost touching the base of the mandibles.

L. ♂ ♀ 3-4 mm., ♀ 3 mm.

This species is probably not truly indigenous, but has occurred in several localities, in houses, &c.; it forms larger communities than *contracta*. I have myself taken the ♀ at Bromley in Kent, flying in the evening at some distance from any houses. A curious form of the ♂ of this species is occasionally found, it is like the ♀ in general form and apterous, but has the genital organs of the ♂ and the abdomen with seven segments. I have seen examples of this form from Oxford.

MYRMICIDÆ.

Abdomen with the first two segments modified into nodes forming a two-jointed petiole, ♀ and ♀ with a well developed sting in all the British genera. No ocelli in the ♀. Number of antennal joints variable, ♂ and ♀ winged in most of the genera, but the ♂ apterous in

Formicoxenus and also in *Anergates*. The latter genus however has not yet occurred in this country. Pupæ always naked.

- | | | |
|----------|--|---------------|
| (12) 1. | ♂ first joint of flagellum simple, ♀ and ♀ with propodeal spines. | |
| (3) 2. | Second node of the petiole spined beneath, ♂ apterous | FORMICOXENUS. |
| (2) 3. | ♂ winged, ♀ and ♀ with the second node of the petiole simple. | |
| (5) 4. | ♂ wings dark fuscous, ♀ and ♀ second node of petiole subquadrate | MYRMECINA. |
| (4) 5. | ♂ wings not dark fuscous, ♀ and ♀ second node much widened posteriorly. | |
| (7) 6. | Apical nerve of submarginal cell in ♂ and ♀ divided by a transverse nervure, last three joints of flagellum in the ♀ not nearly so long as its remainder | MYRMICA. |
| (6) 7. | Apical nerve of submarginal cell not divided by a transverse nervure, last three joints of flagellum as long as or nearly as long as the remainder. | |
| (9) 8. | ♂ antennæ ten-jointed, ♀ and ♀ with the clypeus raised at the sides posteriorly, the carina thus formed limiting the antennary cavities anteriorly | TETRAMORIUM. |
| (8) 9. | ♂ antennæ 12-13 jointed, ♀ and ♀ clypeus simple. | |
| (11) 10. | ♂ frontal area distinct, wings dusky, ♀ and ♀ club of antennæ not very distinct, hairs simple | STENAMMA. |
| (10) 11. | ♂ frontal area not defined, wings hyaline, ♀ and ♀ hairs thickened towards the apex, antennal club more distinct | LEPTOTHORAX. |
| (1) 12. | ♂ first joint of flagellum thickened and globular, ♀ and ♀ without propodeal spines | SOLENOPSIS. |

FORMICOXENUS, Mayr.

♂ apterous, similar to the ♀ in general appearance, ♀ winged, although more commonly met with in the apterous state, maxillary palpi four-jointed, labial palpi three-jointed; ocelli present in the ♂ and ♀, and more or less developed in some of the ♀, antennæ twelve-jointed in the ♂, eleven-jointed in the ♀ and ♀, thorax widest in front and constricted behind the middle in the ♂ and ♀, widest across the middle in the ♀, propodeum spined in both

sexes; abdomen in the ♂, with seven visible segments, of the ♀ and ♀ with six, the second joint of the petiole with a strong spine beneath. This curious little genus, of which the apterous ♂ was discovered by M. Adlerz, is peculiar in the great similarity which exists between the ♂ and ♀, which are hardly distinguishable except by the different number of antennal joints, and of the abdominal segments. M. Adlerz points out that specimens occur somewhat intermediate between the ♂ and ♀, the ocelli being less developed than in the normal ♂, as well as the genital organs. There is only one known species, which associates with *Formica rufa*: it is found always in or near its nests, but beyond this there is little recorded of its habits.

F. nitidulus, *Nyl.* (♀ and ♀, *Stenamma Westwoodi* Sm.: *Saund. Synopsis*).—♂ apterous, very shining, testaceous, abdomen, except the petiole and the extreme base of the third segment, pitchy brown; antennæ darkened near the apex. Mandibles narrow, their external margin obliquely truncate at the apex, internal margin not toothed, genital armature nearly hidden, legs pale, testaceous.

♀ rather larger and darker than the ♂; mandibles widened towards the apex, their apical margin denticulate, thorax widened in the centre, wings with one submarginal and one discoidal cell; abdomen beyond the petiole, pitchy brown, basal joint of the petiole looked at sideways very angular above; legs pale, testaceous.

♀ like the ♂ except as noted in the generic description.

L. ♂, ♀, 3-4 mm., ♀ 5 mm.

Nests of *F. rufa*, Weybridge; Guildford; (*Smith*). Shiere; (*Dr. Capron*). Scarborough; (*Lawson*). Esher; (*Champion*).

MYRMECINA, Curt.

♂ and ♀ winged ♀ apterous; ♂ antennæ thirteen-jointed, ♀ and ♀ twelve-jointed, with a three-jointed club; maxillary palpi four-jointed, labial palpi three-jointed,

mandibles narrow and tridentate in the ♂, in the ♀ and ♀ wide, with two stronger teeth, and numerous smaller ones. Thorax in the ♂ with two very strong crenate lines converging from the front of the mesonotum and uniting near its centre, ♀ with the thorax widest across the middle, ♀ thorax much widest in front, propodeum with two spines in the ♀ and ♀, with two angles in the ♂, wings with one submarginal cell, in the ♂ very pilose; basal node of the petiole nearly square, scarcely raised posteriorly, third segment of the abdomen in the ♀ and ♀ very long, nearly covering the following segment, sting very small; there is only one known species, which exists in small communities, and makes its nests in the ground. Forel says that the ♀ at the least sign of danger folds up its legs and antennæ like those of the nymph, and falls down, remaining motionless; the species is rare and hardly anything is known of its habits.

M. Latreillei, *Curt.*—♂ shining, black, vertex of the head much raised between the eyes, ocelli large, antennæ finely pilose with the first joint about as long as the second and third together, remaining joints about sub-equal in length, except the apical, which is about equal to the two preceding together. Thorax above, very shining, clothed with long hairs, converging lines of the mesonotum, and transverse impression in front of the scutellum, strongly crenate, propodeum with two short angular spines; wings very dark, and pilose fringed with fine hairs; abdomen smooth and shining, clothed with long hairs; legs piceous.

♀ and ♀ pitchy brown, dull, head and thorax longitudinally rugose, clothed with semi-erect hairs, mouth parts, antennæ, and legs reddish testaceous. Scape of antennæ curved, about as long as the flagellum without the apical joint, wings in the ♀ very dusky, not so pilose as in the ♂, propodeum with two strong spines, testaceous towards their apices; abdomen beyond the petiole shining, clothed with long hairs, its apex more or less testaceous.

L. ♂ 3 mm., ♀ 4 mm., ♀ 3 mm.

Worthing; Shiere; Ilfracombe; Bideford. Isle of Wight; (*Curtis*); Luccombe Chine; (*Smith*). Portland; Lulworth; Charmouth; Cranborne; Hurst Castle, Fowey; (*Dale*). Near Down, Kent; Stinchcombe Hill, near Dursley; Stonehouse; (*W. F. White*). Carm Quarry, Plymouth; (*Bignell*).

♂ and ♀ appear in September.

TETRAMORIUM, Mayr.

♂ and ♀ winged, much larger than the ♀. ♀ apterous, ♂ antennæ short, ten-jointed, ♀ and ♀ twelve-jointed, club three-jointed, maxillary palpi four-jointed, labial palpi three-jointed; clypeus in the ♀ and ♀ with its basal margin on each side reflexed, forming a carina, limiting the antennary cavities in front; thorax in the ♂ very large, much wider than the head, mesonotum very much raised, and produced in front over the prothorax, with two converging impressed lines, propodeum in the ♀ and ♀ with two spines; abdomen with the first joint of the petiole much elevated and widened posteriorly, second short, transverse; wings in the ♂ and ♀ large and hyaline, with one sub-marginal and one discoidal cell.

We have only one indigenous species of this genus which is common in many localities; it forms variable sized communities, and in South Europe and the Mediterranean regions it runs into a great number of varieties; its nests are usually underground, or under stones. Forel says that it rarely keeps aphides in its nests, and that the workers carry one another in a manner peculiar to this genus and *Myrmica*. The carrier seizes the one she wishes to carry by the external edge of one of her mandibles and then throws her over her back, so that she lies along the back of her porter with her ventral aspect uppermost, and her legs and antennæ folded as in the nymph state.

T. cæspitum, *Linn.*—♂ pitchy black, mandibles,

antennæ and legs paler. Head very small, rugose, at a much lower level than the very elevated mesonotum, third joint of the antennæ as long as the next three together; thorax very convex in front, above dull, irregularly strigose, clothed with pale hairs, wings with pale nervures; abdomen with the nodes of the petiole dull and hairy, posterior segments shining.

♀ coloured like the ♂ and clothed with scattered hairs, head scarcely narrower than the thorax, first joint of the flagellum wider and longer than any of the following four, which are about sub-equal; mesonotum shining, finely strigose at the sides and posteriorly, scutellum strigose longitudinally, propodeum transversely rugose, with two strong spines; abdomen with the petiole dull, its posterior segments bright and shining.

♀ pitchy-brown, clothed with hairs as in the ♂ and ♀, head large, longitudinally rugose; thorax very wide in front, and truncate, its anterior angles distinct, surface longitudinally rugose, propodeum with two strong spines; abdomen with the petiole slightly shining, its first joint much raised posteriorly and hardly longer than high at the apex, posterior segments shining.

L. ♂ 6-7 mm., ♀ 7-8 mm., ♀ 2-4 mm.

Very common in some localities, especially on sandy sea-coasts; swarms in August.

Two exotic species of this genus occur in hothouses in this country. *T. Guineense* Fab. (*Kollari* Sm.), and *T. simillimum* Sm.; the latter is a much smaller, paler species than *cæspitum*, the former is more brightly coloured, and has the surface of the head and thorax reticulately rugose.

STENAMMA, Westw.

(*Asemorhoptrum*, Mayr.)

♂, ♀ and ♀ nearly equal in size.

♂ and ♀ winged, ♀ apterous, ♂ antennæ thirteen-

jointed, ♀ and ♂ twelve-jointed, maxillary palpi four-jointed, labial palpi three-jointed. Head in the ♂, across the eyes, as wide as the thorax, in the ♀ and ♂ wider, antennæ in the ♀ and ♂ with a very indefinite club, eyes large in the ♂, small in the ♀, very small in the ♂; wings with one submarginal and one discoidal cell, propodeum with two elevated angles in the ♂, with two short spines in the ♀ and ♂. Abdomen with the first joint of the petiole very long, and comparatively slightly raised posteriorly.

There is only one recorded species of this genus, which is rare and very little is known of its habits; its nests are formed in the ground, under moss, dead leaves, &c., according to E. André, and although often met with in, or in the vicinity of, other ants' nests, he does not think there is any relationship between them.

S. Westwoodi, *Westw. (Ippula Nyl. Smith, Saund., &c.)*.—♂ pitchy brown, slender, clothed with fine scattered hairs, mandibles, legs and antennæ paler; head dull, scape of the antennæ not so long as the apical two joints, first joint of the flagellum much wider than the rest; thorax dull, mesonotum rugose, with two converging lines, propodeum nearly smooth, depressed, with two apical angular elevations, wings dusky, nervures pale; abdomen with the first joint of the petiole very long, from a sideways view much longer than high at the apex, second segment nearly round, posterior segments shining; legs slender.

♂ and ♀ testaceous, with the head finely and reticulately rugose, frontal area smooth, carinæ between the antennæ much raised, scape slightly curved, flagellum forming an indefinite club; thorax longitudinally rugose, mesonotum not truncate or angulated in front in the ♂; wings of the ♀ as in the ♂, but less clouded, propodeum with two small angular spines; abdomen with the petiole as in the ♂, posterior segments shining.

L. ♂ 4 mm., ♀ 5 mm., ♂ 3.3½ mm.

The ♀ somewhat resembles that of *Tetramorium cespitum*, but the long first joint of the petiole and the rounded anterior angles of the thorax, as well as the reticulated surface of the head, will at once distinguish it.

Rare. Under dead leaves, Chobham, near a nest of *Formica rufa*, and another of *L. fuliginosus*; Ilfracombe one ♂ September. Maidstone two ♀ August and September (*Frisby*). London District; Tunbridge Wells; Norwich; D al; Freshwater; Isle of Wight; Seaton; Mount Edgcombe; Clovelly; Godmanstone; all winged and occurring in October; (*Dale*). Corfe Castle; (*G. F. Smith*). Lynton; Charlton, Kent; (*W. F. White*). Bickleigh, Devon; (*Bignell*).

LEPTOTHORAX, Mayr.

♂ and ♀ winged, ♀ apterous. ♂ antennæ twelve or thirteen jointed, ♀ and ♀ eleven or twelve jointed, frontal area indistinct, maxillary palpi five-jointed, labial palpi three-jointed. Thorax in front rounded in the ♀, wings with one submarginal, and one discoidal cell, tibiae of intermediate and posterior legs without calcaria in the ♀ and ♀; all the species clothed with more or less clavate hairs.

The species of this genus generally form small communities and make their nests in dead wood, under bark, or sometimes in bramble stems; occasionally in the ground or under stones. Their nests have not been known to contain *aphides* or myrmecophilous beetles. We have two British species, one of which has two distinct races which used to be considered as specifically distinct, the species of the Palearctic region number about twelve.

1. Antennæ of ♂ twelve-jointed, of ♀ and ♀ eleven-jointed ACERVORUM.
2. Antennæ of ♂ thirteen-jointed, of ♀ and ♀ twelve-jointed TUBERUM.

L. acervorum, *Fab.*—♂ pitchy black, mandibles and

legs brown, apices of the femora paler, tarsi very pale; head and thorax dull, rugose, clothed with long erect hairs, scape of the twelve-jointed antennæ scarcely more than twice as long as wide, first joint of flagellum nearly as broad as long, second twice as long as the first; propodeum with two angular teeth posteriorly, wings milky white, nervures almost colourless; abdomen shining, clothed with erect hairs, nodes of the petiole rounded, about equal to each other in length.

♀ and ♂ clothed with scattered hairs, head and abdomen beyond the petiole pitchy brown, antennæ, except at the apex, mandibles, thorax, petiole of the abdomen and legs testaceous; head finely rugose, antennæ eleven-jointed, scape considerably bent at the base, club three-jointed; thorax slightly rugose, constricted across the middle in the ♀, wings in the ♀ as in the ♂, propodeum with two strong spines; abdomen with the first segment of the petiole much raised posteriorly, and with a small tooth-like spine beneath, second joint nearly round, both joints more or less rugose, posterior segments of the abdomen shining; tibiæ without calcaria on the second and hind pairs of legs, anterior metatarsi curved.

L. ♂ and ♀ 4.5 mm., ♀ 4 mm.

Nests under bark, in old stumps, rarely in the ground. ♂ and ♀ appear in September. Woking. Maidstone; (*Frisby*). Dawlish, Devon; (*Bignell*). Stonehouse "common;" Forest of Dean; Wye District; Wellington College; Lynmouth; (*W. F. White*). Shirley, often in nests of *F. sanguinea* (*Rothney*). London district; (*Smith*). Hampshire and Dorsetshire "common"; (*Dale*). Scotland "common." Carlingford, Ireland. (*W. F. Johnson*).

L. tuberum, *Fab.* (*Nylander*, *Fierst. unifasciatus*, *Latr.*) — ♂ much smaller than that of *acervorum*, testaceous or pitchy brown, head and thorax dull, antennæ with the scape much longer than the second joint of the flagellum, which is scarcely longer than the first, first almost as wide as

the scape, mandibles with four or five teeth ; thorax in some varieties somewhat shining, propodeum with very ill-defined posterior angles, wings very transparent, nervures pale, abdomen shining.

♀ and ♂ clothed with scattered hairs, testaceous ; head and thorax in the ♀ of race *unifasciatus* often fuscous, abdomen generally with a black, or dark central band ; head longitudinally rugose, antennæ with the scape slightly curved, basal joint of flagellum longer and thicker than the following ones, club very distinct, three-jointed, dark in race *unifasciatus* ; thorax longitudinally striated ♀, or rugose ♂, much constricted in the middle in the ♂, propodeal spines strong in race *Nylanderi*, feeble in race *unifasciatus*, wings of the ♀ as in the ♂ ; abdomen with the nodes of the petiole very indefinitely rugose, posterior segments shining, in the ♀ sometimes with a dark apical band on each segment ; intermediate and posterior tibiæ without calcaria.

L. ♂ $2\frac{1}{2}$ mm., ♀ $3\frac{1}{2}$ -4 mm., ♂ $2\frac{1}{2}$ -3 mm.

Under bark, stones, &c., I have found large nests of race *unifasciatus*, under stones at South Hayling ; race *Nylanderi* has occurred to me only in small numbers. I have never found a nest of it ; I have some males bred from ♂ eggs kindly sent to me by Mr. J. E. Fletcher.

Chobham ; Wimbledon ; Bromley. Bures, Suffolk. Nests under poplar bark ; (*Harwood*). Isle of Wight ; Seaton ; Portland ; Lulworth ; race *unifasciatus* ; (*Dale*). Lee, Kent ; *Nylanderi*, (*W. F. White*). Shirley, *Nylanderi* ; (*Rothney*). Exeter, *Nylanderi* ; (*Parjitt*).

MYRMICA, Latr.

♂ and ♀ winged, ♂ apterous ; antennæ thirteen-jointed in the ♂, twelve-jointed in the ♀ and ♂, maxillary palpi six-jointed, labial palpi four-jointed ; wings with one sub-marginal cell, whose external marginal nerve is divided by

a transverse nerve which enters the cell and half divides it; all the tibiæ with pectinated calcaria. The short apical joints of the flagellum, the last three of which taken together are not nearly so long as the remainder, and the transverse nervure which half-divides the submarginal cell in the wings of the ♂ and ♀, distinguish this genus at once. We have but one of the two European species, but of this there are five distinct races. Some of these are known to harbour *Aphides* in their nests, and also the curious beetles, *Atemeles emarginatus* and *paradoxus*; these, however, also inhabit other ants' nests. The ♂ and ♀ swarm in September; the ♀ carry each other as described under *Tetramorium*.

M. rubra, *Lin.*—♂ dark, or pale brown, shining, surface with scattered semi-erect hairs, head across the eyes wider than the thorax, mesothorax in front, propodeum and abdomen polished and shining, wings more or less dusky, propodeum with two angular spines.

♀ and ♂ testaceous, or pitchy, clothed with scattered hairs, head and thorax more or less rugose or striated, propodeum with two spines; abdomen with the nodes of the petiole varying from very rugose to nearly smooth, posterior segments shining; thorax in the ♀ constricted in the middle.

The different races can be best distinguished by the following table, but occasionally intermediate forms occur which are difficult to refer to their proper race. A curious gynandromorphic specimen of race *levinodis* is figured by Smith, Ent. Annual, 1874, frontispiece, fig. 3.

- | | |
|--|-------------------|
| (6) 1. ♂ with the scape of the antennæ half as long as the flagellum, and also only gradually curved near the base, ♀ and ♂ with the scape not angularly and sharply bent near the base. | |
| (3) 2. Frontal area longitudinally striated | . . . SULCINODIS. |
| (2) 3. Frontal area smooth and shining. | |
| (5) 4. ♂ tibiæ with long erect hairs; ♀ propodeal spines not longer than their basal width; ♀ spines scarcely longer than in the ♀, the space between them smooth and shining | . . . LEVINODIS. |

- (4) 5. ♂ tibiae with short somewhat decumbent hairs,
♀ and ♀ propodeal spines much longer
than their basal width, intervening space
rugose RUGINODIS.
- (1) 6. ♂ scape of antennæ not a quarter so long as
the flagellum, or if half as long then sharply
bent near the base, ♀ and ♀ scape sharply
and angularly bent near the base.
- (8) 7. ♂ scape of antennæ very short, not longer than
the first two or three joints of the flagellum;
♀ and ♀ scape flattened at the bend but
not spinose SCABRINODIS.
- (7) 8. ♂ scape half as long as the flagellum, sharply
bent at the base; ♀ and ♀ scape not flat-
tened but spinose at the bend LOBICORNIS.

Of these, *lobicornis* and *sulcinodis* are the darkest, although *scabrinodis* may be almost as dark; *sulcinodis* in the ♀ and ♂ is of a redder colour and very rugose; *ruginodis* and *levinodis* are much smoother, and the longer scape with its regular bend give to these races a peculiar appearance, which distinguishes them easily from *scabrinodis* when the eye is once familiar with it. Most of the races are common, *scabrinodis* particularly so; *sulcinodis* is rare, but occurs at Chobham and Woking. Bloxworth; Studland; Bourne-mouth; Parley Heath; (*Dale*).

Lobicornis occurs at Chobham; Rannoch; (*Dale*). Shirley, in nest of *F. sanguinea*; (*Rothney*). Lowestoft; (*Smith*). North Wales; Exmoor; (*W. F. White*).

SOLENOPSIS, Westw.

♂ and ♀ winged, much larger than the ♀. ♂ antennæ twelve-jointed, ♀ eleven-jointed, ♀ ten-jointed; first joint of the flagellum in the ♂ much swollen and rounded, club two-jointed in the ♀ and ♀; the apical joint very long, maxillary palpi two-jointed, labial palpi two-jointed; mesonotum of ♂ without converging lines, propodeum without spines or teeth, wings with one submarginal and one discoidal cell.

There is only one species in England of this genus, which

usually inhabits the walls, &c., of other ants' nests, making its galleries in them. Forel says that although they live in such close proximity to the owners of the walls they fight ferociously when they meet; their galleries are so fine that they only just admit the insects, so that their larger hosts cannot follow them.

S. fugax, *Latr.*—♂ pitchy brown, shining, legs, antennæ and mandibles pale, scape very short, not longer than the first and second joints of the flagellum together, first joint of the flagellum inflated and globular; thorax much raised above the head, somewhat as in *Tetramorium*, very shining, without converging lines, propodeum simple, nervures of wings pale, abdomen shining.

♀ testaceous, shining, clothed with pale hairs; antennæ with the apical joint of the two-jointed club very long, almost as long as the first eight joints of the flagellum, eyes of ordinary size; thorax shining, wings as in the ♂, abdomen shining, with the first joint of the petiole much raised behind, hardly longer than high, second joint rounded.

♀ pale testaceous or flavous, clothed with pale hairs; head nearly as broad as long, eyes exceedingly small, antennæ as in the ♀, but only ten-jointed; thorax shining, propodeum rounded posteriorly, without spines or angles; abdomen shining, petiole as in the ♀.

L. ♂ 4 mm., ♀ 5.6 mm., ♀ 1½-2½ mm.

Rare; Sandown, Isle of Wight; (*W. W. Fowler*); South-end and Deal; (*F. Smith*).

(**Monomorium Phaëonis**, *Lin.* — (*Diplorhoptrum domesticum*, *Smith.*) This insect is now a common pest in many houses, although in no way indigenous.

It belongs to the same division as *Solenopsis*, the ♂ having no converging lines on the mesothorax and the ♂ and ♀ no propodeal spines or angles; its elongate form and almost naked surface distinguish it from *S. fugax*, as well as the short terminal joint of the antennæ, which is

not more than half as long as the rest of the flagellum, and three-jointed club; the ♂ has the antennæ thirteen-jointed and the basal joint of the flagellum simple.)

(*Pheidole megacephala*, *Fab.*, is another introduced species which has occurred in a bake-house in the Borough, London, and also in some greenhouses; the ♂ and ♀ may be known by the two submarginal cells in the wing, the ♀ may be known by the long three-jointed club of the antennæ, and the shining smooth surface; the head in the "soldiers," as they are called, is often of enormous size.)

(*Cremastogaster scutellaris*, *Oliv.*, has occurred in hot-houses; this may be known at once by its black colour, shining surface, and sometimes red head, but structurally by the petiole uniting with the third abdominal segment dorsally.)

FOSSORES.

This section embraces a number of very diverse forms, whose habits differ very much in the various genera. They all provide their larvæ with animal food, although they nourish themselves with vegetable; the food is supplied fresh to the larvæ, the parent having stung the caterpillars, spiders, or other insects with which she provisions her nest, so that they are practically paralyzed but do not die till her eggs hatch and the larvæ want them for food. The *Mutillide*, with which the section begins, have a certain amount of superficial resemblance to the *Heterogyna*, the females being apterous and thus somewhat similar to the ♀ of the ants; their solitary habits and the absence of the ♂ form, however, prevent their being confused with them. Some few genera are wasp-like in their coloration, but the simple wings, which are never longitudinally folded when at rest, distinguish them therefrom. Some of the red and black-bodied species, such as *Alyson*, &c., might be and are sometimes mixed by beginners with species of

Sphecodes, but failing other characters their simple (not branched) hairs will at once serve to show the section they belong to. The tongue in all the genera is blunt and bifid, although in some, such as *Sapyga*, *Ammophila*, &c., it is of considerable length; none of the species are densely hairy, most of them being clothed only with a few scattered hairs, although in *Mutilla* they are more abundant; many of the genera make their nests in sandy soils and hide the hole when they leave it by shuffling sand over it. Fabre, in his *Souvenirs Entomologiques*, gives a most interesting account of *Bembex* (a genus not represented in Britain), marked specimens of which he removed to a considerable distance from their homes, letting them out of a window in a house situated in a town, and found that they went straight back into their apparently hidden holes; the ♀ in this section has no pollen-collecting apparatus, and the first joint of the posterior tarsi is not dilated as it is in nearly all the *Anthophila*; the hairs are simple, the antennæ are thirteen-jointed in the ♂, twelve in the ♀; the neururation of the wings affords useful characters, as well as the form of the ventral apical segments of the abdomen in the ♂. The section may be divided into two natural divisions by the following thoracic characters:—

- I. Pronotum much produced backwards dorsally and laterally, its posterior angles reaching to the tegulæ of the wings, or ♀ apterous.
- II. Pronotum not much produced backwards, often consisting of little more than a narrow collar, its posterior angles produced but not extending to the tegulæ; ♀ never apterous.

DIVISION I.

- | | | |
|-----|--|------------|
| (4) | 1. Eyes small, or large and reniform, not touching the base of the mandibles. | |
| (3) | 2. ♂ with penicilli on the eighth dorsal valve, or an upturned process on the eighth ventral, ♀ apterous | MUTILLIDÆ. |
| (2) | 3. Eyes large and reniform, ♂ with the valves of the eighth segment simple, ♀ winged | SAPYGIDÆ. |
| (1) | 4. Eyes large, touching the base of the mandibles. | |

- (6) 5. Intermediate tibiae with one long spur; intermediate coxae remote TIPHIDÆ.
 (5) 6. Intermediate tibiae with two long spurs; intermediate coxae contiguous POMPILIDÆ.

MUTILLIDÆ.

♂ winged in our British species, ♀ apterous, eighth dorsal segment of the ♂ bearing penicilli—(I have not, however, been able to test *Methoca* as to this character)—but in that genus the ♂ has the eighth ventral segment produced into an upturned process. Probably all the members of this family are parasitic, but their habits are very little known. *Mutilla europæa* has been frequently found in the nests of *Bombus*. I have placed *Myrmosa* and *Methoca* in this family instead of in the *Scoliidae*, where Thomson places them, as the structure of the ♂ apical segments, and the apterous condition of the ♀ seem to me to relate them herewith. We have three British genera, which are easily distinguishable.

- (2) 1. Intermediate coxae distant, ♀ without ocelli MUTILLA.
 (1) 2. Intermediate coxae contiguous, ♀ with ocelli.
 (4) 3. ♂ eighth ventral valve simple, ♀ thorax with scarcely noticeable constrictions, much shorter than the abdomen MYRMOSA.
 (3) 4. ♂ eighth ventral valve with an apical upturned process, ♀ thorax very long and narrow, with two distinct constrictions, nearly as long as the abdomen METHOCA.

MUTILLA, Linn.

Of this very extensive genus, which extends over nearly the whole globe, we have only two representatives. The ♂ is winged and the ♀ apterous in our British species and in almost all the others, but there are a few curious exceptions to the rule among the S. European species, and probably also among the exotics. In the exceptions which I am acquainted with the ♂ closely resembles the ♀, but the

thirteen-jointed antennæ, the ocelli and thoracic constrictions are characteristic of the ♂ only. Head small and round. Antennæ thirteen-jointed in the ♂, twelve-jointed ♀; ocelli present in ♂ only, eyes small; surface of body hairy, strongly punctured; pronotum in the ♂ of both our British species angularly emarginate posteriorly, in the ♀ short, not visible above in *rufipes*; anterior wings with three submarginal cells, tegulæ very large; tibiæ of the ♀ denticulate; abdomen with golden bands or fringes.

- (2) 1. Large, ♂ with the impressed longitudinal lines of the mesonotum only visible posteriorly, ♀ without a silvery spot on the basal segment of the abdomen EUROPEÆ.
 (1) 2. Small, ♂ with the impressed lines of the mesonotum produced to its anterior margin, ♀ with a silvery spot on the basal segment of the abdomen RUFIPES.

M. europæa, Linn.—♂ dark steel blue, strongly punctured and clothed with thick black hairs; mesonotum red, its impressed lines vanishing as they approach the anterior margin, scutellum and post-scutellum red, propodeum reticulately rugose, red, except at the apex and sides, the pleuræ and sterna entirely black, tegulæ large, black, wings dusky, nervure between the second and third submarginal cells incomplete; abdomen incurved at the apex, steel blue, with an entire band of silvery hairs on the first and a slightly interrupted one on the second and third segments; legs black; ♀ larger and broader than the ♂, black, thorax above nearly quadrangular, meso and meta-thorax entirely red, surface as in the ♂, but the sides of the mesothorax and propodeum shining, smooth and concave, spiracles transverse, black; abdomen widest behind the middle, with the first, second and third segments banded with golden hairs at the apex, the bands of the second and third interrupted widely in the middle; legs black, densely hairy, tibiæ spinose.

L. ♂ 11–12 mm., ♀ 13–15 mm.

Rare, especially the ♂; has frequently been taken in

nests of *Bombus*; the ♂ frequents flowers. I have taken it at Bournemouth on *Rubus*. Bournemouth; Darenth and Birch Woods; (*Smith*). Wellington College; (*W. F. White*). Teignmouth; Parley Heath; New Forest; (*C. W. Dale*). Stoke Wood, near Exeter; (*Parfitt*). Hastings; Colchester, several ♂, and one ♀ "curled round a young oak twig in a curious manner"; (*Harwood*). Croydon; (*Rothney*). Chobham; (*Beaumont*). Rochester; Isle of Purbeck; Swanage; (*Marshall*).

M. rufipes, *Latr. (ephippium Fab.)*.—Clothed in both sexes with fine erect whitish hairs; ♂ shining, deeply punctured throughout; ♀ dull, head and thorax deeply punctured, abdomen finely so.

♂ head black, with a longitudinal impression on each side of the vertex and a short central one behind the middle ocellus; pro and meso-notum and scutellum red, the former sometimes black, propodeum, mesopleuræ, and sterna black, rarely with the thorax entirely black, meso-notum with two deep entire longitudinal lines, tegulæ large, red, wings dusky, nervure between the second and third submarginal cells incomplete, propodeum clathrately rugose; abdomen black, segments fringed with silvery hairs at the apex, first and second and apical segments beneath largely punctured, the rest largely punctured at the apex only; legs black, clothed with silvery hairs.

♀ black, thorax, legs, mouth parts, tubercles above the insertion of the antennæ and base of the antennæ testaceous red, head and thorax above very largely punctured, the latter slightly narrowed posteriorly, metanotum with a slight transverse shining tubercle on its brow, pleuræ bright and shining; abdomen sometimes paler towards the apex, a round spot and apical band of silvery golden hairs on the first segment, and the second segment entirely clothed with silvery golden hairs, dorsal valve of the sixth segment flat, finely and longitudinally striate; tibiæ spinose.

L. 5–8 mm.

Common in some sandy localities, Deal, Woking, Chatham; Bournemouth; Hayling Island. Plumstead; Charlton, near Greenwich; Sandown, Isle of Wight; Southend; Weybridge; St. Margaret's Bay; (*Smith*). Parley Heath; (*Dale*). Norwich; (*Bridgman*). Lowestoft; (*Morice*).

MYRMOSA, Latr.

♂ much larger than the ♀, winged, ♀ apterous, antennæ ♂ thirteen-jointed, ♀ twelve jointed. Ocelli developed in both sexes, eyes round, not sinuated on the inner margin; wings of the ♂ with three submarginal cells; segments of the abdomen much impressed at the base, second segment looked at sideways more than twice as deep as the first, apical ventral valve simple; ♀ mutilliform, intermediate coxæ contiguous. There are only four or five known species of this genus, of which we have one in this country. Very little is known of the habits of the species.

M. melanocephala, *Fab.*—♂ black, very largely and rugosely punctured, clothed with erect silvery hairs; pronotum arcuately emarginate posteriorly, mesonotum with two very short longitudinal impressions posteriorly, wings smoky, nervures black, scutellum and propodeum with a central longitudinal impression; abdomen with the segments depressed at the base, apical dorsal valve bifid, with a deep longitudinal impression near the apex, first and second segments beneath each with a basal tooth-like spine, all the segments ciliated with pale hairs; tibiæ and tarsi densely clothed with short pale semi-adpressed hairs.

♀ clothed with short pale hairs, head black, largely punctured, antennæ and mouth parts testaceous, the former dusky towards the apex; thorax testaceous red, rugose, pronotum about half as long as the meso and meta-notum together, divided from the mesonotum by a nearly straight suture; abdomen very strongly punctured on the basal

segment, less so on the following ones, basal segment, the second laterally at the base, and the apices of the others testaceous, apical valve simple; legs testaceous.

L. ♂ 6-10 mm., ♀ 5-7 mm.

Not uncommon in sandy localities, ♂ often on wild carrot. Woking; Chatham; Weybridge; Hastings; Herne Bay; Littlehampton; Lowestoft. Charlton; Hampstead; Coombe Wood; Hawley Green, Hants; Sandown Bay; Luccombe Chine; Southend; Deal; Wakefield; (*Smith*). Glanvilles Wootton; Lulworth; Charmouth; Parley Heath; (*Dale*). Banks of Lynher; Cornwall; common; (*Marshall*). Bournemouth; (*W. F. White*). Exminster; (*Bignell*). Morthoe, Devon; (*Swale*). Christow, Devon; (*Parfitt*). Wotton-under-Edge; (*V. R. Perkins*). Shiere; (*Capron*). Colchester; (*Harwood*). Oxford; (*R. C. L. Perkins*). Shirley; (*Rothney*).

METHOCA, Latr.

♂ much larger than the ♀, winged, ♀ apterous; ♂ elongate, black and shining, wings with three submarginal cells, the basal one very elongated with an indication of a divisional nerve on its lower margin, apex of the eighth ventral segment produced into an upturned spine; ♀ black and red with distinct constrictions between the thoracic segments. There is only one European species of this genus, which is very rare, especially in the ♂ sex, which used to be known under the name of *Tengyra Sanivitali*. Nothing is known of its habits.

M. ichneumonides, Latr.—♂ black, elongate, shining, clothed with short whitish hairs, head strongly punctured, clypeus with an elevated central tooth, basal joint of antennæ very thick, the remainder thin, gradually tapering to the apex; thorax strongly punctured, pronotum arcuately emarginate posteriorly, mesothorax with two lateral longitudinal impressions, wings nearly hyaline, scutellum triangularly raised in the centre, propodeum rounded, rugose; abdomen elongate, very shining, finely and remotely punc-

tured, basal segments slightly impressed at the base, beneath simple, eighth ventral valve with a strongly curved apical process; legs with very long tarsi, the posterior metatarsi nearly as long as the tibiæ.

♀ very shining, with very short scattered hairs, red, head, except the mouth parts and antennæ, and abdomen black; head much wider than the thorax; thorax elongate, deeply constricted between the segments, each of which is very convex dorsally, the prothorax is the widest, the mesonotum small and narrow, with a deep division marking off the scutellum; abdomen shortly petiolate, ovate, somewhat acuminate posteriorly, impunctate, its apex narrowly testaceous; tibiæ finely spinose.

L. ♂ 7-12 mm., ♀ 6-9 mm.

Rare, on sandy commons, &c., the ♂ exceedingly scarce. I took it once at Chobham by sweeping after 8 p.m. in hot thundery weather. Chobham; Woking, occasionally. Weybridge; Blackwater, Hants; High Peak, Sidmouth; Hampstead Heath; Southend; Lyme Regis; Black Gang Chine and Sandown, Isle of Wight; (*F. Smith*). Oxshott; (*Billups*). Lulworth; Charmouth; (*Dale*). Morthoe, North Devon; (*Dr. Swale*). Land's End; (*Marquand*). Banks of Lynher, Cornwall, with *Myrmosa*, but rarer; (*Marshall*).

TIPHIIDÆ.

Eyes entire, not sinuate on their inner margin, antennæ thick, not claviform, convoluted in the ♀; pronotum truncate in front, tegulæ very large; femora sub-compressed, tibiæ spinose, intermediate coxæ distant, posterior coxæ very large; ♂ with the eighth ventral segment terminating in an upturned process.

TIPHIA, Fab.

Of this genus there are only two British, but numerous Continental species. The species may be known from

those of any other genus by the truncate anterior and posterior margins of the thorax; the eyes are of normal size and reach to the mandibles; pronotum elongate, wings with the marginal cell complete or incomplete, two sub-marginals, propodeum horizontal, with three longitudinal carinæ, abruptly truncate posteriorly; abdomen with the basal segment narrower than the next; legs with the tibiæ and tarsi strongly spinose, claws bifid.

- (2) 1. Larger, wings with the marginal cell open at the apex in the ♀, ♂ with a transverse carina near the base of the first abdominal segment FEMORATA.
 (1) 2. Smaller, marginal cell closed in both sexes, ♂ first abdominal segment simple MINUTA.

T. femorata, *Fabr.*—Black, shining, clothed with scattered shining white hairs, posterior and intermediate femora and tibiæ in the ♀ red, or rarely black; head and thorax largely punctured, propodeum scarcely punctured, carinated posteriorly, with three longitudinal carinæ, the central one slightly abbreviated, wings rather dusky, nervures dark brown, marginal cell open at the apex in the ♀; abdomen in the ♂ with the basal segment subglobose, in the ♀ distinctly narrower than the second, largely punctured, eighth ventral valve in the ♂ with an upturned process; legs very shining, tibiæ and tarsi densely spinose, tarsi with a series of spines round the apex of each joint, claws bifid.

L. 8–12 mm.

Common in some places but local. Often on *Daucus carota*; Southwold. Ipswich; Barham, Suffolk; (*Rothney*). Colchester; (*Harwood*). Lowestoft; (*F.D. Morice*). Cromer; Birchwood; Blackwater, Hants; Sandhurst; near Windsor; Southend; Deal; North Devon; (*Smith*). Stoke Wood, near Exeter; Fordlands, near Ide; (*Parfitt*). Land's End; (*Marquand*). Woollacombe, North Devon; (*Sicale*). Freshwater Bay, Pembrokeshire; (*Marshall*).

T. minuta, *V. de Lind.*—Much smaller than the pre-

ceding legs black in both sexes, wings with stigma larger, the marginal cell complete in both sexes, all the carinae of the propodeum reaching the terminal carina; ♂ without a transverse raised line at the base of the first abdominal segment.

L. 6-7 mm.

Woking; Chobham; Hastings; Ilfracombe. Hampstead; Southgate; Colney Hatch; Branton Burrows, North Devon; (*Smith*). Glanvilles Wootton; Dorset; (*Dale*). Wotton-under-Edge; (*R. C. L. Perkins*). Eaton and Mousehold, Norfolk; (*Bridgman*). Dawlish; (*Parfitt*). Land's End; (*Marquand*). Tavistock; (*Swale*). Rugby; (*Morice*).

SAPYGIDÆ.

A very small family, consisting of only a few genera, of which we have one in this country. The species inhabit decaying wood. Smith has seen the ♀ carrying a green caterpillar and entering a burrow, and on digging into the bank four cells filled with small green caterpillars were found, from which he reared specimens of *S. 5-punctata*. Eyes large, reniform, touching the mandibles, antennae long, thickening towards the apex; pronotum truncate in front; abdomen in our British genus elongate, sub-claviform, its sides straight and sub-parallel. Eighth ventral segment in the ♂ exposed ventrally.

SAPYGA, Latr.

Generic characters as given above; also wings with four submarginal cells, third submarginal much narrowed anteriorly, its apical nerve sinuate. Maxillary palpi six-jointed, labial palpi four-jointed, tongue rather elongate, calcaria of anterior legs bifid at the apex.

- (2) 1. ♂ apical joint of antennae very short,
narrower than the preceding. ♀ with
the abdomen red across the middle . 5-PUNCTATA.

- (1) 2. ♂ apical joint as long as the penultimate,
 these two forming a distinct club. ♀
 with the abdomen not banded with red. CLAVICORNIS.

S. quinque-punctata, *Fab.*—♂ head and thorax black, deeply, closely, and largely punctured, clypeus and a small spot in the sinus of each eye anteriorly, pale yellowish white, antennæ reddish yellow beneath in the middle, apical joint very short, looking as if it were sunk into the preceding one; pronotum with a very small whitish spot on each side of its front margin, wings slightly dusky; abdomen black, shining, finely punctured, second, third, and fourth, and sometimes the fifth segment with a pale transverse spot on each side, above and beneath; posterior tibiæ white at the base.

♀ black, the second and third abdominal segments, except the apex of the latter, red; head sometimes with a small, pale spot on each side of the clypeus, one just above the antennal cavities, and one near each eye, pale, antennæ black, terminal joint as long as the preceding; pronotum with a small, transverse spot on each side of the front margin; abdomen pointed, widest behind the middle, with a transverse spot on each side of the fourth and fifth segments, and a central one on the sixth, pale yellow, beneath unspotted; legs clothed with silvery hairs.

The markings in both sexes are very variable.

L. 9–12 mm.

Common in some places, although I have rarely met with it; burrows in palings, old gate posts, &c. Wandsworth; Bromley. Norwich; Yorkshire; Devonshire; Kent; Hants; (*Smith*). Exeter; (*Parfitt*). Guestling, nr. Hastings; (*Frisby*). Eastbourne, nr. Convalescent Home; Colchester; (*Harwood*). Yorkshire; Lancashire and Cheshire; (*Gardner*). Birmingham; (*Marshall*). Gloster; (*Perkins*). Bury St. Edmunds; (*Swale*).

S. clavicornis, *Linn.*—A narrower and more slightly-built insect than the preceding; the third submarginal

cell with its apical nervure less sinuate, and its anterior margin nearly two-thirds as long as its posterior, in the preceding species it is scarcely half as long.

♂ with the antennæ much longer and slenderer, and the penultimate and apical joints forming a distinct club, these two joints are sub-equal in length, and have each a deep impression posteriorly, the pale colour of the underside stops abruptly at the end of the eleventh joint, leaving the twelfth and thirteenth entirely black; in colour and markings the males of the two species are much alike.

♀ much narrower than in *5 punctata*, antennæ more distinctly clavate, the basal joints of the flagellum distinctly more slender than in that species; the pronotum is longer in proportion to its width, and the entire thorax is quite twice as long as wide; the abdomen is narrower and more parallel-sided, black, with two spots on the second, a band or two spots on the third and fourth, and a central spot on the sixth segment, yellow, the second, third, and fourth segments in the specimen before me are spotted also beneath, and all the tibiæ are pale at the base.

L. 9–11 mm.

I have never captured this distinct species, and am indebted to Dr. Mason, of Burton-on-Trent, for the loan of two of Mr. F. Smith's examples, from which I have drawn up my description. It is recorded from Herefordshire, Nottingham, Birmingham, and near Wakefield.

POMPIDIDÆ.

This family is composed of, perhaps, the most active of all the members of the order; they never fly for any long distance, but proceed by means of running with short intermediate flights; in their running movements they much resemble ants; they make their nests in sandy banks, &c., generally making rather irregularly-shaped holes; they nearly all provision their nests with spiders, stung so

as to be paralyzed, at least, so far as our English species have been observed in this matter. Fabre, *Nouv. Souv. Ent.*, p. 210, mentions a spider which he took away from a *Salix* which lived in a fresh but immobile condition for seven weeks. They are rarely to be met with except in bright sunshine, as they hide, or crouch unseen, as soon as the sunshine passes away. The characters of the family are the long pronotum, which is usually angularly or arcuately emarginate posteriorly, the long slender legs with very large coxæ, the intermediate pair contiguous, the two-spurred intermediate tibiæ and the penicilli on the eighth dorsal segment of the ♂; the abdomen in the ♂ is as a rule longer and narrower than in the ♀.

- | | | | |
|------|-----|--|--------------|
| (2) | 1. | Vertex not punctured | POMPILUS. |
| (1) | 2. | Vertex closely punctured. | |
| (10) | 3. | Antennæ inserted almost immediately above the clypeus: sheaths of the sting retractable into the apical segment in ♀. | |
| (7) | 4. | Wings with the anterior basal transverse nervure not uniting with the posterior. | |
| (6) | 5. | ♂ basal segment of the abdomen not long, and subpetiolate, posterior tibiæ of the ♀ serrate | SALIUS. |
| (5) | 6. | ♂ basal segment of the abdomen very long and subpetiolate, posterior tibiæ of the ♀ simple | PSEUDAGENIA. |
| (4) | 7. | Anterior and posterior basal nervures uniting. | |
| (9) | 8. | Maxillæ bearded at the base; ♀ posterior tibiæ simple | AGENIA. |
| (8) | 9. | Maxillæ not bearded; ♀ posterior tibiæ serrate | CALICURGUS. |
| (3) | 10. | Antennæ inserted at some distance above the clypeus; ♀ with the sheaths of the sting always exerted beyond the apex of the abdomen | CEROFALES. |

POMPILUS, Fab.

A very extensive genus, the number of whose species is probably quite uncertain; the male characteristics are well defined, whereas those of the female are often most obscure, and almost defy appreciation. It used to be split

up into several genera, but I have followed Kohl, in treating *Aporus* and *Evagethes* as sub-genera; we have fifteen species recorded from this country; Kohl, in 1884, records 483 known species, of which 133 are palæarctic; the genus extends over nearly the whole world, and much requires monographic treatment. Antennæ curled at the apex after death, forehead and vertex impunctate, pronotum posteriorly angularly or arcuately emarginate, wings with two or three submarginal cells; abdomen in the ♂ with eight segments exposed ventrally, the extreme central apex of the seventh only visible, the eighth varying much in shape, and affording good specific characters, the eighth dorsal valve is hidden beneath the seventh, and bears two penicilli, which are often visible beyond the apex of the seventh; in the ♀ the sixth segment is convex dorsally, and pointed at the apex; legs very long and slender, tibiæ in both sexes simple, not serrate, more or less spinose.

- | | | | |
|------|-----|---|-------------|
| (4) | 1. | Wings with two submarginal cells. | |
| (3) | 2. | ♂ thorax nearly as long as the abdomen, only slightly convex longitudinally; ♀ pronotum as long as wide (Subg. <i>Aporus</i> , Spin.) . . . | UNICOLOR. |
| (2) | 3. | ♂ thorax not nearly as long as the abdomen, very convex longitudinally; ♀ pronotum wider than long (Subg. <i>Evagethes</i> , Lep.) . . . | BICOLOR. |
| (1) | 4. | Wings with three submarginal cells. | |
| (14) | 5. | Abdomen black, not red at the base, or black with white spots. | |
| (11) | 6. | Pronotum arcuately emarginate posteriorly. | |
| (8) | 7. | Fourth, fifth, and sixth segments of the abdomen compressed laterally beneath and subcarinate . . . | SERICEUS. |
| (7) | 8. | Fourth, fifth, and sixth segments of the abdomen not compressed. | |
| (10) | 9. | Pronotum densely hairy; anterior tarsi in ♀ with very long spines . . . | RUFIPES. |
| (9) | 10. | Pronotum not or scarcely hairy; anterior tarsi in ♀ with very short spines . . . | CINCTELLUS. |
| (6) | 11. | Pronotum angularly emarginate posteriorly. | |
| (13) | 12. | ♂ densely clothed with sericeous grey | |

- pubescence; ♀ apical dorsal valve remotely and finely hairy . . . PLUMBEUS.
- (12) 13. ♂ without sericeous grey pubescence; apical dorsal valve of ♀ densely clothed with black bristly hairs . . . NIGER.
- (5) 14. Abdomen red at the base.
- (18) 15. Propodeum more or less pilose dorsally.
- (17) 16. Larger; the basal segments with an apical black band; ♂ apical ventral valve not carinate . . . VIATICUS.
- (16) 17. Small; basal segments entirely red; ♂ apical ventral valve carinate . . . CONSOBRINUS.
- (15) 18. Propodeum not pilose, or rarely so on its sides only.
- (30) 19. Pronotum sharply angulated posteriorly.
- (23) 20. ♀ with the anterior tarsi not bearing a series of long regular spines; ♂ with the posterior tibiae deeply sinuate inwardly, or with the apical ventral valve laterally compressed.
- (22) 21. ♂ with the posterior tibiae sinuate, thickened at the apex; third submarginal cell triangular in both sexes; ♀ face between the eyes considerably longer than wide . . . MINUTULUS.
- (21) 22. ♂ tibiae simple; third submarginal cell in both sexes subquadrate; ♀ face between the eyes almost as broad as long . . . SPISSUS.
- (20) 23. ♀ anterior tarsi with a regular row of long spines (called the pecten); ♂ posterior tibiae simple; apical ventral valve not laterally compressed.
- (25) 24. ♂ with the fourth, fifth, and sixth ventral segments longitudinally impressed; ♀ dorsal apical valve with thick bristly hairs . . . CHALYBEATUS.
- (24) 25. ♂ ventral segments not impressed; ♀ dorsal apical valve hairy, but not bristly.
- (27) 26. ♂ apical ventral valve flat, with a well-marked carina at the base, no pendant spine; ♀ sides of the propodeum with fine hairs, spines between the claws very long and regular, longer than the pulvilli . . . UNGUICULARIS.
- (26) 27. ♂ apical ventral valve not flat and carinated; ♀ sides of the propodeum not pilose; spines between the claws shorter and less regular.
- (20) 28. ♂ apical ventral valve with a long

- pendant spine near the centre; ♀
 apical ventral valve carinated. WESMAELI.
 (28) 29. ♂ and ♀ apical ventral valve simple. GIBBUS.
 (17) 30. Pronotum arcuate posteriorly PECTINIPES.

(SUBG. APORUS.)

P. unicolor Spin. *bicolor*, Smith, var. *femoralis* v. d. Linden.—♂ black, clothed with sericeous silvery pubescence; posterior femora red beneath near the apex; face nearly round, antennæ inserted close together; pronotum as long as the mesonotum to the scutellar suture, scutellum triangularly raised above the metanotum, wings slightly dusky, with a darker apical band on both pairs, anterior wings with two submarginal cells, propodeum very long; abdomen with the ventral segments apparently simple. But in both my examples the apical segment is unfortunately retracted.

♀ black, clothed with a sericeous, in some lights almost prismatic, pile; wings very dark; abdomen more or less red on the basal segments; face round, antennæ inserted close together just above the margin of the clypeus; pronotum nearly twice as long as the mesonotum to the scutellar suture; propodeum long and rather flat, abruptly declivous posteriorly, wings very dark fuscous with two submarginal cells; abdomen rather elongate, apical segment scarcely hairy; legs black, tibiæ with a few very short spines.

L. 8–10 mm.

Very rare, Woking, July, 1888, ♂. Steephill, Ventnor; 4 ♂, 3 ♀, July, 1871; (*Rothney*). High Peak, Sidmouth, ♂; Southend, 2 ♀; Pakefield, nr. Lowestoft, ♀; (*Smith*). Middlemarsh, Dorset, 1835; (*J. C. Dale*). Portland, 1891, ♀; (*Enock*).

(SUBG. EVAGETHES.)

P. bicolor, *Lep.*—♀ black, clothed with a fine sericeous pile, first and second abdominal segments more or less red.

Antennæ not very close together at their bases, pronotum more declivous than in *Aporus*, thorax not so long as the abdomen, wings dusky with a darker apical band, two submarginal cells; abdomen with the apical ventral valve slightly convex narrowed and rounded at the apex; tibiae and tarsi finely spinose.

♀ broader than the ♂, the abdomen with the first, second and base of the third segments red. Exceedingly like the ♂ of *P. pectinipes*, but wings with only two submarginal cells, and the division between the pro and meso-thorax rather straighter and the apical segments of the abdomen beneath rather less hairy.

L. 6-7 mm., ♀ 8-9 mm.

Chobham; Woking; Bournemouth. Sidmouth; (*R. C. L. Perkins*). Middlemarsh; Parley Heath; Barmouth; (*Dale*). Colchester; (*Harwood*).

(SUBG. POMPILUS.)

P. sericeus, *V. d. Lind.* (*acuminatus*, *Smith*).—♂ Black, head very delicately punctured, with a few larger shallow punctures interspersed, face below the antennæ clothed with thin silvery hairs, antennæ rather thick, narrowing to the apical joint; pronotum arcuately emarginate, finely punctured as also the mesonotum, propodeum more strongly so, with silvery hairs at the sides, wings slightly clouded across the apex, second submarginal cell larger and oblong, third large, slightly narrowed above; legs black, femora inclining to piceous red; abdomen smooth, shining, apical segment with a pale spot, beneath with the fourth to the apical segment laterally compressed and almost carinated, apical valve strongly so.

L. 8-10 mm.

Hab.—Kirkpatrick Juxta, Moffat, Scotland.

I have seen the original specimens from which Smith described, and have no doubt that they are large examples of this species.

P. rufipes, *Linn.*.—Black, head, pronotum, sides of the thorax and basal segment of the abdomen hairy; pronotum arcuately emarginate posteriorly, wings with a dark apical band; abdomen with a white lateral spot on each side of the base of the second to the fifth segments and one in the centre of the sixth, those of the third and fourth sometimes wanting, and the abdomen in the ♂ sometimes entirely black; apical ventral valve of the ♂ carinated, its apex largely rounded; apical dorsal valve of the ♀ without long hairs; legs black, femora and tibiæ often more or less red, front tarsi of the ♀ with very long spines, claws with a strong tooth near the middle.

L. ♂ 7–10 mm., ♀ 9–15 mm.

Hayling Island. Isle of Wight; Deal; Lowestoft; Southend, July to September; (*Smith*). High Peak, Sidmouth; Bournemouth; Parley Heath; Exmouth; (*Dale*). Portlemouth; (*Bignell*). Exmouth Warren; High Peak, Sidmouth; (*Parfitt*); Norfolk; (*Bridgman*). Lancashire; (*Gardner*).

P. cinctellus, *Spin.*.—♂ black, clothed with fine grey silky pubescence, wings hyaline, dusky at the apex; a small spot on the inner margin of each eye, a spot on the apical segment of the abdomen, and a small spot at the base of the posterior tibiæ, white, apical ventral valve carinate; calcaria of the posterior tibiæ very long, almost as long as the metatarsi.

♀ black, mandibles, a bilobate spot on the clypeus, a spot near each eye, and a transverse spot on each side of the pronotum posteriorly, pale flavous; wings hyaline, anterior wings with a broad, dark, subapical band, hind wings with a broad, dark, apical one; abdomen with glossy grey pubescence; legs red, the extreme apices of all the joints dusky, anterior tarsi not pectinated.

L. ♂ 4–6 mm., ♀ 6–9 mm.

Sandy banks, June and July: Chobham; Woking; Hawley, Hants; Devonshire; (*Smith*, who says it provisions its nest with small spiders.) Colchester; (*Harwood*).

Bristol; New Forest; (*Dale*). Exeter; Prawle Point; (*Parfitt*).

P. plumbeus, *Fabr.* (*pulcher*, *Shuck*).—♂ black, densely clothed, except on the antennæ and at the extreme base of the abdominal segments, with silvery grey decumbent pubescence, which gives it an ashy grey or glaucous appearance; pronotum angularly emarginate posteriorly, wings hyaline, front pair with a dark apical band; abdomen beneath with the apex only of the segments grey, sixth very deeply incised at the apex.

♀ black, wider than the ♂, clothed less densely with finer grey hairs, which give a grey tint only to the face, thorax beneath, the apices of the abdominal segments, and the legs, anterior tarsi very strongly pectinated.

L. ♂ 5-7 mm., ♀ 6-9 mm.

Common on most sandy coasts, from June to August, occurs also occasionally inland.

P. niger, *Fab.* (var. *approximatus*, *Sm.*, *melanarius*, *Bold*).—Entirely black, wings dusky, with a darker apical band, third submarginal cell sometimes petiolated; head and thorax with a few scattered long hairs, pronotum angularly emarginate posteriorly; abdomen with the second, third and fourth segments clothed at the base with fine grey pubescence; apical ventral valve in the ♂ compressed, carinated and densely hairy, apical dorsal valve in the ♀ clothed with stiff bristle-like hairs, anterior tarsi in the ♀ without long serial spines.

Var. *approximatus*, *Sm.*, has the third submarginal cell subquadrate.

L. ♂ 5-7 mm., ♀ 10-12 mm.

I have taken a ♂ of this species as early as June, and a ♀ as late as October. It is generally distributed, but commoner in the west.

Smith says it provisions its nest with green larvæ.

V. R. Perkins says that near Wotton it preys on a large soft brown wood spider.

P. viaticus, *Linn.* (*fuscus*, *Sm.*).—♂ head and thorax

black, clothed with scattered black hairs, face silvery below the antennæ; pronotum very shallowly emarginate posteriorly, propodeum more or less silvery, clothed with scattered hairs, wings dusky, with a dark apical band; abdomen elongate, first three segments red, the apex of the third and the whole of the following segments black, the apical margins of the first and second segments are also as a rule dusky, sixth and seventh segments flattened dorsally, sixth ventral segment, deeply emarginated in the centre with a small elongate fovea on each side, seventh wide, flat, and subtruncate, carinated at the base; legs with the tibiæ spinose.

♀ larger and stouter than the ♂, without silvery hairs on the face and propodeum, but the black hairs thicker and more abundant, wings darker than in the ♂; abdomen red, with a dark band, produced in the middle, on the first, second, and third segments, the rest entirely black, the sixth clothed with bristly black hairs; front tarsi pectinated.

L. 10–15 mm.

Common, occurs from April to August, provisions its nest with spiders. This year (1893) I saw it as early as 31st March.

P. consobrinus, *Dahlb.*—Much smaller than *viaticus*, and differing from all the following species which resemble it in colour, by the finely pilose propodeum; emargination of the pronotum more sharply angulated than in *viaticus*; abdomen without the black apical band on the first and second segments, apical dorsal valve in the ♀ with only a few fine hairs, apical ventral valve in the ♂ convex, carinated at the base, and somewhat pointed at the apex.

L. 6–8 mm.

Rare, but probably overlooked. Hayling Island; sand-hills on the west of the island. Norwich; (*Bridgman*). Colchester; (*Harwood*). Land's End; (*Marquand*). Hastings.

P. minutulus, *Dahlb.* (*cellularis*, *Thoms.*).—Black, the first and second segments of the abdomen and the base of

the third red, pronotum with its posterior margin sharply emarginate, wings with a broad fuscous apical band, third submarginal cell triangular.

♂ with the posterior tibiae sinuate on the side towards the body, and incrassated at the apex; apical dorsal valve of the abdomen slightly concave, apical ventral valve broad, flat, and shortly hairy, widely rounded at the apex, sixth segment impressed at the apex.

♀ with the anterior tarsi simply spined, not pectinate, face between the eyes considerably longer than wide.

L. 8-9 mm.

Chobham; Woking; and probably elsewhere, but overlooked.

P. spissus, *Schiödt*. — Like the other red-bodied species in colour.

♂ with a well-defined apical band on the anterior wings, third submarginal cell subquadrate; abdomen slightly wider and more ovate than in the other species, apical dorsal valve flat, apical ventral valve much compressed laterally, carinated and pointed at the apex, which is very bristly, very convex longitudinally, much resembling that of *P. niger*, sixth ventral plate squarely notched at the apex.

♀ with the anterior tarsi as in *minutulus*, i.e. not pectinate, third submarginal cell subquadrate; face between the eyes almost as wide as long; apical dorsal valve finely pilose.

L. ♂ 8 mm., ♀ 9-10 mm.

Widely distributed but more common in the West and North, Woking. Colchester; (*Harwood*). Gloucestershire; (*F. R. Perkins*). Glanvilles Wootton, Dorset; (*Dale*). Bristol; Yorkshire; (*Smith*). Oxford; (*R. C. L. Perkins*). Boxley, near Maidstone; (*Frisby*). Salcombe; (*Marshall*).

P. chalybeatus, *Schiödt* (♂ *sericatus*, *Shuck.*, *pectinipes*, ♂ *Smith*). — Like the other red bodied species in colour but distinguishable from them in both sexes by having the posterior margin of the pronotum less sharply angulated,

and the posterior wings with the posterior nerve united with the median exactly where the branch of the latter is emitted, whereas in the other species the posterior unites with the median at a point nearer the abdomen than the juncture of the median nerve with its branch.

The ♂ may be known further by the unusual abundance of its sheeny pubescence, by the fourth, fifth and sixth ventral plates of the abdomen being longitudinally concave, the fourth slightly, the fifth deeply emarginate at the apex, beyond the fifth appear three lobes, of these I think the central one belongs to the sixth segment and the lateral ones to the seventh, apical valve rounded at the apex, simple.

♀ with the clypeus very smooth and shining in front, its margin not raised at the sides, and with only two stiff setæ projecting from above the glabrous margin; abdomen with its apical dorsal valve densely clothed with black bristly hairs; anterior tarsi pectinated.

L. ♂ 8 mm., ♀ 10-12 mm.

Chobham; Woking; Southwold; Deal; Bournemouth. Colchester; (*Harwood*). London District; (*F. Smith*). Portland; New Forest; Bristol; (*Dale*). Lowestoft; (*Morice*). Camber; (*Frisby*). Land's End; (*Marquand*).

P. gibbus, *Fab.*—Like the other red-bodied species in colour; posterior emargination of pronotum very sharply angular; posterior wings with the branch of the median nerve not uniting with the posterior.

♂ fourth and fifth ventral plates not concave, fifth almost entire at the apex, sixth notched, with an impression on each side of the notch, apical valve convex, rounded at the apex, with a few longer, pendant, apical hairs.

♀ clypeus with its apical margin slightly sinuate, and more or less raised towards the sides, largely and irregularly punctured, with a series of long setæ above the margin; head and pronotum with scattered, bristly hairs, cheeks behind the eyes not so hairy as in the following species;

abdomen with its apical dorsal valve with fine exerted hairs; anterior tarsi pectinated, all the tarsi with the spines between the claws less regular, and shorter than in the following.

L. ♂ 7-8 mm., ♀ 9-10 mm.

Common in sandy localities, and generally distributed.

P. unguicularis, *Thoms.*—Exceedingly like *gibbus*, but the ♂ very distinct by its flat carinated apical ventral valve. The ♀ is far more difficult to recognize; it is, however, generally rather larger than *gibbus*, the face is less convex, the eyes rather closer together on the vertex, the cheeks behind the eyes more pilose, as well as the pronotum, so that the interval between the back of the head and the front of the prothorax seems to be filled with hairs; the vertex of the head also is more hairy than in *gibbus*, the sides of the propodeum are finely pilose, whereas they are not so in *gibbus*, and the comb of spines between the claws is longer and more regular, but this character is difficult to see, and not to my mind a very satisfactory one.

L. ♂ 8-9 mm., ♀ 10-11 mm.

Hayling I.; Deal; Woking; Chobham; Herne Bay; Bournemouth. Lowestoft; (*Morice*). Colchester; (*Harwood*). Gloucestershire; (*V. R. Perkins*).

P. Wesmaeli, *Thoms.*—♂ easily distinguished from any of our other species by the long pendant spine on the apical ventral valve of the abdomen. I am not satisfied as to the ♀ of this, but have followed Thomson in assigning to it a few females which I have, with distinctly carinated apical ventral valves; one of these I caught on the same day, and I believe in the same spot, as the ♂; at the same time, many species of *Pompilus* often occur together, and the apical ventral segment of *gibbus* is often subcarinate.

L. ♂ 7-8 mm., ♀ 9-10 mm.

Woking; Chobham. Bournemouth; Colchester; (*Harwood*).

P. pectinipes, *V. de L.*—Like the other red-bodied species in colour, but clothed more densely with fine glossy pubescence, silvery in some lights, brown in others, and with the posterior emargination of the pronotum arcuately emarginate in both sexes.

♂ with the apical ventral valve carinated at the base, its sides somewhat sinuate, and with a shorter carina uniting with the basal one on each side.

♀ with the head narrower than in *gibbus*; the antennæ shorter and stouter; abdomen with the base of the first, second, and third segments clothed with a sort of glaucous bloom visible only in certain lights; the ♀ varies very much in size.

L. ♂ 8-9 mm., ♀ 6-9 mm.

Woking; Chobham; Deal; Southwold. Hampstead; (*Shuckard*). Southend; (*Smith*). Wotton-under-Edge; (*V. R. Perkins*). Barmouth; Parley Heath; (*Dale*). Hastings; (*Frisby*). Rugby; (*Morice*). Norfolk; (*Bridgman*). Colchester; (*Harwood*). Southport; (*B. Cooke*). Perth; Sandwich; Milford; Salcombe; (*Marshall*).

SALIUS, Fab.

(SUBG. PRIOCNEMIS, Schiödtc.)

Very like *Pompilus* in general characters and appearance, but distinguishable in either sex by the finely punctured or coriaceous vertex of the head, and in the ♀ by the serrate posterior tibiæ, and the transverse impression on the second ventral segment of the abdomen; the radial cell is more elongate, and the submarginal cells, which are always three in number, are larger, and extend further towards the apex of the wing; the distinguishing characters of the species, as in *Pompilus*, are more pronounced in the ♂ than in the ♀.

This again is a very extensive genus, second only to *Pompilus* amongst the *Fossores*; we have seven British species. Kohl, in 1884, records 223 known species, of which he says 65 are Palæarctic. It is distributed over nearly the whole world. All the British species belong to the sub-genus *Priocnemis*; they may thus be tabulated:—

- | | | | |
|------|-----|---|----------------|
| (2) | 1. | Propodeum pilose | FUSCUS. |
| (1) | 2. | Propodeum not pilose. | |
| (4) | 3. | Propodeum transversely rugose in the
♀; both sexes with a dark, well-
defined apical band on the front
wings | AFFINIS. |
| (3) | 4. | Propodeum not transversely rugose;
♂ without a defined apical alar
band. | |
| (6) | 5. | Cubital nervure of front wing pro-
duced to, or almost to, the apical
margin | EXALTATUS. |
| (5) | 6. | Cubital nervure of front wing not
nearly reaching the apex. | |
| (8) | 7. | Upper basal nervure of front wings in
a continuous curve; pronotal emar-
gination very deep in the ♀; ♂
abdomen generally black, or nearly
so | NOTATULUS. |
| (7) | 8. | Curve of the upper basal nervure dis-
tinctly broken at the origin of the
cubital nervure; pronotal emargina-
tion less deep in the ♀; ♂ abdo-
men red at the base. | |
| (10) | 9. | Legs more or less red; ♀ with the
clypeus widely polished at the apex;
♂ apical ventral segment carinated | OBTUSIVENTRIS. |
| (9) | 10. | Legs rarely otherwise than entirely
black; ♀ clypeus entirely dull, or
bright only at the extreme margin;
♂ ventral apical segment not cari-
nated. | |
| (12) | 11. | ♂ apical ventral valve of the abdo-
men notched at the apex, with
the sides fimbriated, ♀ with a
clear round spot near the apex of
the anterior wing | FUSILLUS. |
| (11) | 12. | ♂ apical ventral valve very narrow,
its sides not fimbriated; ♀ apical
clear spot of the wings wanting or
ill-defined | PARVULUS. |

S. fuscus, Linn. (*sepicola* Sm.).—Head and thorax

black, pilose, vertex distinctly punctured; pronotum deeply and angularly emarginate posteriorly, wings slightly smoky, clouded towards the apex and across the submarginal and three discoidal cells, propodeum dull, finely pilose, not rugose; abdomen shining, elongate-ovate in the ♂, more broadly ovate, and somewhat acuminate in the ♀, first and second segments entirely red, third entirely so or only so towards the base, the rest black, apical ventral valve in the ♂ flat, deeply emarginate at the apex, fringed with curved hairs at the sides, ♀ with the apical three segments above, and all the segments beneath pilose; anterior tibiæ pale in front in the ♂, posterior tibiæ serrate in the ♀.

L. 15-18 mm.

Mr. Frisby possesses a curious specimen of this species, in which the third submarginal cell (left wing) is divided near the middle by a transverse nervure.

Woking; Chobham; Esher. Colchester; (*Harwood*). Oxford; (*R. C. L. Perkins*). G. Wootton; Weymouth; Portland; Bournemouth; (*Dale*). Hastings; Maidstone; (*Frisby*). Lancashire; (*Gardner*). Devon; (*Parfitt*). Land's End; (*Marquand*). Norfolk; (*Bridgman*). Armagh; (*Johnson*).

S. affinis, *V. de Lind*.—Like *fuscus* in coloration, but the ♂ with the legs entirely black, and both sexes with a well-defined dark band at the apex of the wings.

The ♂ may be further known by the glabrous propodeum, and the somewhat concave rounded apical ventral valve, fringed with short hairs at the sides, sixth segment impressed, emarginate at the apex.

♀ with the pronotum very wide in front, its posterior emargination very obtuse, metanotum transversely rugose; abdomen less shining than in *fuscus*, clothed with a fine, white, silky pile.

L. 10-15 mm.

Rare. Chobham. Woking; (*Morice*). Ripley; Weybridge; Southend; Deal; Walmer; (*Smith*). Norfolk;

Whitsand Bay, Plymouth; Portlemouth; (*Bignell*). Bar-mouth; (*Dale*).

S. exaltatus, *Fab.*—Head and thorax black, finely punctured; pronotum deeply and angularly emarginate posteriorly, wings clouded in both sexes across their apical third, with a very ill-defined subquadrate spot in the ♂, and a clear round hyaline one in the ♀ beyond the apex of the third submarginal cell, curve of the basal nervure distinctly broken at the origin of the cubital nervure, cubital nervure extending to the apical margin, propodeum more elongate than in the following species; abdomen red at the base, the apex of the third segment and the whole of the following segments black, ♂ with the apical ventral valve somewhat truncately rounded at the apex, punctured and pilose, sixth polished at the apex, and slightly emarginate, with an impression on each side, bounded by a smooth raised line; ♀ with the apical segments pilose, apical ventral valve not carinated; legs black, anterior tibiæ in the male testaceous in front, posterior calcaria in the male three quarters, in the female half, or more than half, as long as the metatarsus.

Long. 9–15 mm.

Common, and generally distributed.

S. notatulus, *Saund.* (*notatus*, *Saund. olim. Smith, Thoms., &c., nec Ross*). ♂ usually with the abdomen entirely black, sometimes with the second segment red, in the ♀ coloured like *exaltatus*; both sexes with the femora and tibiæ sometimes more or less red; face with a well-defined impressed line extending from the central ocellus to between the antennæ; wings smoky in the male, coloured as in *exaltatus* in the ♀, rather short, curve of the basal nervure continuous, not distinctly broken at the origin of the cubital, which latter does not nearly reach the apical margin; ventral apical valve in the male narrow, slightly convex at the base, in the female not carinated.

L. 6–8 mm.

Rare, Chobham. Chertsey; (*Billups*). Erith; Darenth; Harrow; Deal; Littlehampton; (*Smith*). Glanvilles Wootton; Bournemouth; Barmouth; Exmouth; (*Dale*).

S. obtusiventris, *Schödtte* (*agilis* *Shuck.*).—Closely resembles *exaltatus* in the ♂ sex and the two preceding in the ♀, the ♂, however, may be readily known by the narrow ventral apical valve, which bears a narrow pilose central carina; the ♀ may be known by the shining apex of the clypeus, the less sharply emarginate pronotum, which has a small shining angular region just above the emargination, which gives the emargination the effect of being deeper than it really is; the longer propodeum which more resembles that of *exaltatus* and the subcarinate apical ventral valve; the neuration of the wings resembles that of *exaltatus*, but the cubital nervure is abbreviated as in *notatulus*; the legs are coloured as in *notatulus*, but the impressed line of the face is very short, and extends but a very little way from the insertion of the antennæ.

L. 7-11 mm.

Littlehampton. Bury St. Edmunds; (*Tuck*). Erith; Darenth and Birch Woods, Kent; Harrow; (*Smith*). Charmouth; Bournemouth; (*Dale*). Ventnor; (*Rothney*).

S. pusillus, *Schödtte*.—Very like *obtusiventris*, but easily distinguished in the ♂ sex by the fimbriated apical ventral valve, which is emarginate at the apex; the females of the two species are much more difficult to separate, as the femora in *pusillus* are often reddish; but this species is smaller, the pronotal emargination and polished space above it are similar to that of *obtusiventris*, but the propodeum is distinctly shorter and more convex dorsally, and the clypeus is less widely shining at the apex, the first abdominal segment also is more declivous at the base; neuration of the wings as in the preceding species and the apical ventral valve subcarinate.

L. 5-8 mm.

Chobham, Herne Bay, commonly on *Umbelliferae*, with

S. exaltatus. Oxford; (*R. C. L. Perkins*). Hastings; (*Frisby*). Haldon; Whitsand Bay, Plymouth; Slapton; (*Bignell*). Gloucestershire; preys on a small smooth hairless spider; (*V. R. Perkins*). Perth.

S. parvulus, *Dahlb.*—In colour like the preceding species, but the wings in the ♀ without any definite round apical spot.

♂ with the apical ventral valve narrow, the sides not fimbriated, the apex truncate, and the base keeled in the centre.

♀ with the surface rather more shining, the wings with a dusky streak across the second and third submarginal cells, and a dusky cloud in the third discoidal, the apex of the wings widely clouded, beyond the apex of the third submarginal is a clearer spot, but this does not take a regular round form as in the other species; another good specific distinction is the very short basal margin of the scutellum, which is perceptibly shorter than in *pusillus*.

L. 4–8 mm.

This is the smallest species of the genus, although large females attain the size of the preceding.

Common on sandy banks, &c., Woking; Chobham; Bournemouth; Bromley. Oxford; (*R. C. L. Perkins*). Seaton; Swanage; (*Dale*). Land's End; (*Marquand*). Devon; (*Parfitt*). Colchester; (*Harwood*).

CALICURGUS, Lep.

We have only one British representative of this genus. Kohl, in 1884, says that there is only one described species, but that he knows nine undescribed species in collections. It is closely allied to *Salix*; but differs in having the upper and lower transverse basal nervures of the anterior wings united, and also in the great dissimilarity in colour of the sexes, and the very long white calcaria of the ♂.

C. hyalinatus, *Fab. (fasciatellus, Shuck.)*

♂ black, head and thorax punctured, clothed with short whitish hairs; pronotum shallowly angulated, mesonotum slightly raised in the centre posteriorly, wings somewhat smoky, especially towards the apex, cubital nervure extending to the apical margin, propodeum declivous, rather short; abdomen elongate, clothed with very fine grey pubescence, apical ventral valve somewhat parallel-sided; legs black, femora generally more or less red towards the apex, especially the posterior pair, which are often nearly entirely red, calcaria very long, white.

♀ Black, first and second abdominal segments red, apex of the second in the centre black, sides of the third at the base red; head pro and mesonotum finely punctured, finely and remotely pilose, pronotum very shallowly emarginate posteriorly, scarcely angulated, propodeum nearly smooth, shining, with scattered erect hairs, anterior wings dusky along the basal transverse nervures, and with a dark brown spot, nearly covering the marginal, second and third submarginal and part of the third discoidal cells, third submarginal larger than the second; abdomen clothed with exceedingly fine short adpressed pubescence, sixth dorsal valve bristly, the fifth also with a few scattered bristles; legs and calcaria black, posterior tibiæ serrate and spinose.

L. ♂ 7-9 ♀, 9-10 mm.

Woking; Charlwood, Surrey. Highgate; Hampstead; Fulham; Barmouth; (*Smith*). Lincoln; (*Fowler*). Colchester; (*Harwood*). Sidmouth; (*R. C. L. Perkins*). Sandown; (*Marshall*). Glanvilles Wootton; Lulworth. Lyndhurst; (*Dale*). Hastings; (*Frisby*). Exeter; (*Parfitt*). Norfolk; (*Bridgman*). Gloucestershire; (*Perkins*).

PSEUDAGENIA, Kohl.

Distinguishable from *Salix* by the simple, not serrate posterior femora of the ♀, and in both sexes of our British

species by the third submarginal cell being distinctly wider than high, and the second more transverse; the clypeus in the ♂ is emarginately truncate, and the sides of the face white.

We have only one British species. Kohl cites seven Palearctic species, out of a total of 118 otherwise distributed over the Oriental, Australian, Nearctic and Neotropic regions.

P. carbonaria, Scop. (*punctum*, Fab.).—Both sexes black; but the ♂ with the sides of the face below the antennæ, the mandibles and a spot on the apical dorsal valve of the abdomen, white. Head and pronotum finely and closely punctured, clothed with scattered hairs, which are more abundant in the ♂; wings smoky, propodeum finely rugose transversely and pilose; abdomen somewhat shining, clothed with a fine sericeous pile, basal segment in the ♂ very narrow, apical ventral valve narrow, subcarinate; tibiæ in both sexes with only a few very short spines.

L. 7–9 mm.

Rare, London District; Canterbury; Birch Wood; Bexley; Bridgenorth; (*Marshall*). Hammersmith; (*Smith*). Bristol; Barmouth; (*Dale*). Chobham; (*Billups*). Colchester; (*Harwood*). Hastings; (*Frisby*). F. Smith says, "I bred both sexes of this species from cells constructed of mud, very similar to those formed by different species of *Pelopæus*."

AGENIA, Schiödte.

Closely allied to *Pseudagenia*, but distinguished from it in both sexes by the united anterior and posterior basal nervures of the forewings, and in the ♀ by the bearded maxillæ, and the two dark transverse bands of the forewings; these are represented also in the ♂, but only very faintly; the posterior tibiæ in both sexes are simple, with only fine exserted hairs.

This is a small genus, of which we have only two British species. Kohl records six altogether; four Palearctic, one Neo-tropical, and one Australian.

- (2) 1. *Metanotum* smooth; punctured . . . HIRCANA.
 (1) 2. *Metanotum* transversely rugose . . . VARIEGATA.

A. hircana, *Fab. (bifasciata, Smith, Shuck.)*.—Black, shining, head and thorax closely punctured, sparingly pilose, pronotum very obtusely angulated posteriorly, wings in the ♂ with a slight cloud along the anterior basal nerve of the forewings and across the radial and second and third submarginal cells, as well as the third discoidal; in the ♀ with two distinct bands in the same regions, propodeum shining, punctured, its sides slightly pilose; abdomen shining, very finely punctured, apical ventral valve in the ♂ compressed laterally, viewed sideways subtriangular or hatchet-shaped, with its base deep and straight, its apex hairy; ♀ with the apical segments densely clothed with bristly hairs; legs with fine exserted hairs on the tibiae.

L. 6-8 mm.

Woollacombe, N. Devon; Coombe Wood; Colney Hatch; New Forest; Hampstead; Barmouth; (*Smith*). Salcombe; Keswick; (*Marshall*). Sopworth, Wilts; (*R. C. L. Perkins*). Maidstone; (*Frisby*). Wotton-under-Edge, Gloucestershire; (*V. R. Perkins*).

A. variegata, *Linn.*.—In colour and general appearance like the preceding, but more strongly and more remotely punctured, prothoracic emargination very shallow and arcuate, propodeum transversely rugose, and more distinctly pilose at the sides; ♂ with the apical ventral segment, viewed sideways not abruptly truncate at the base, clothed with long hairs.

L. 6-10 mm.

Coombe Wood; Wakefield, Yorkshire; (*Smith*). N. Forest; Bristol; Glanvilles Wootton; Portland; (*Dale*). Steeplehill, Ventnor; (*Rothney*). Wotton-under-Edge, Gloucestershire; "in old stumps, runs under the bark; its prey is a large

brown wood spider; sometimes nests in gate posts and rubble of stone walls or sandy banks"; (*V.R. Perkins*). Sopworth, Wilts; (*R. C. L. Perkins*). Salcombe; (*Marshall*).

CEROPALES, Latr.

Of this very distinct genus we have only two British species, both of which are black with yellow or red markings, and both may be at once known from any other genus of the *Pompilidæ* by the antennæ being inserted high up above the base of the clypeus; wings with the cubital nervure extending to the apical margin; the ♀ may also be known by the long exerted sheaths of the sting, and by the antennæ, which after death do not tend to curl up spirally; ♂ with the penicilli very wide and foliaceous, not constricted at the base and not palpiform, the tibial spines in both sexes are so short as to be hardly observable. Kohl in 1884 quotes forty-two species of this genus, nine being Palearctic.

- (2) 1. Abdomen not red at the base, black with yellowish-white markings MACULATA.
 (1) 2. Abdomen red at the base VARIEGATA.

C. maculata, Fabr.—Black, head and thorax finely rugulose, with large shallow scattered punctures, sides of the face and of the clypeus in the ♀, entire face below the antennæ, clypeus, and labrum in the ♂, yellowish-white, the white colour extending laterally above the insertion of the antennæ, antennæ in both sexes with a spot on the front of the first joint and generally also of the second white; pronotum semicircularly emarginate, with a wide, whitish band along the emargination, post scutellum white, shining, apex of propodeum above the posterior coxæ white; abdomen black, finely punctured, clothed with fine grey pubescence, two lateral spots on the first segment, a band on the apex of the second, and a spot on the apex of the fifth and sixth in the ♀, and also of the seventh in the ♂ yellowish-white; apical

ventral valve in the ♂ largely rounded and widely reflexed, in the ♀ compressed and carinated; legs testaceous red, except the coxæ and trochanters, the former generally white spotted, femora black at the base, and sometimes the posterior pair also at the apex, apex of posterior tibiæ and of all the tarsi dusky.

L. 7-10 mm.

Not common, but widely distributed, generally on *Umbelliferae*. Not recorded from Scotland.

C. variegatus, *Fab.*—Differs from *maculatus* in having the labrum white in both sexes, in the absence of the large shallow thoracic punctures, in the interrupted pale posterior band of the pronotum, and the red basal segments of the abdomen; the second segment has a white spot on each side at the apex, and the sixth a large round central spot, apical ventral valve not widely reflexed as in *maculatus*.

L. 6-7 mm.

Very rare; Chobham, ♀ Aug., 1876. Parley Copse, Hants; (*Rudd*). Weybridge, ♀ Aug., 1844; ♂ Aug., 1845; (*Smith*). Weybridge, 1854; (*Grant*).

DIVISION II.

SPHEGIDÆ.

I have followed Kohl in considering all the sand wasps with short prothoraces as belonging to one great family. Our British sand wasps are capable of being arranged tolerably clearly in well-defined groups, but when the exotic species are considered as well, these definitions break down, and there appears to be no better way than to unite them as Kohl has done. The divisional character (see ante, p. 43) is sufficient to distinguish the family, but it contains two very distinct sections, viz. one in which the petiole of the abdomen is entirely formed of the ventral plate of the segment, the other in which both ventral and dorsal plates

unite to form it. The old families, *Sphegidae*, *Pemphredonidae*, and *Mimesidae*, belong to the first section, the remainder of our genera to the second.

- | | | | |
|------|-----|--|-------------|
| (38) | 1. | Anterior wings with more than one submarginal cell, although the second in <i>Trypoxylon</i> is enclosed by such exceedingly fine nervures that it may be easily overlooked. | |
| (9) | 2. | Mandibles with a deep incision on their outer margins at some distance from the base, or with the marginal cell appendiculated. | |
| (4) | 3. | Eyes in the ♂ meeting on the vertex, eighth dorsal valve bearing penicilli, both sexes with the mandibles simple | ASTATA. |
| (3) | 4. | Eyes not meeting on the vertex in either sex; mandibles with an incision beneath. | |
| (6) | 5. | Three submarginal cells | TACHYTES. |
| (5) | 6. | Two submarginal cells. | |
| (8) | 7. | Second submarginal petiolated | MISCOPHUS. |
| (7) | 8. | Second submarginal not petiolated | DINETUS. |
| (2) | 9. | Mandibles simple, marginal cell not appendiculated. | |
| (11) | 10. | Two submarginal cells, posterior and apical nerves of second exceedingly fine and transparent, hardly noticeable | TRYPOXYLON. |
| (10) | 11. | Two or more submarginal cells, all the nerves distinct. | |
| (27) | 12. | Abdomen petiolated, and the petiole formed of the ventral plate only, the dorsal portion of the segment uniting with it at some distance from the base. | |
| (14) | 13. | Petiole cylindrical, or nearly so, elongate | AMMOPHILA. |
| (13) | 14. | Petiole flattened, often very short. | |
| (24) | 15. | Anterior wings with two submarginal cells. | |
| (19) | 16. | Anterior wings with only one recurrent nervure. | |
| (18) | 17. | Recurrent nervure and apical nervure of first submarginal cell interstitial | SPILOMENA. |
| (17) | 18. | Recurrent nervure uniting with the cubital near the centre of the first submarginal cell | STIGMUS. |
| (16) | 19. | Anterior wings with two recurrent nervures. | |

- (21) 20. Head and thorax with long hairs . . . PEMPHEREDON.
 (20) 21. Head and thorax destitute of long hairs.
 (23) 22. Labrum notched at the apex, posterior tibiæ denticulate . . . DIODONTUS.
 (22) 23. Labrum pointed at the apex, posterior tibiæ smooth . . . PASSALÆCUS.
 (15) 24. Wings with three submarginal cells.
 (26) 25. Anterior and posterior basal transverse nervures of anterior wings forming a well-defined angle at their juncture; posterior calcaria robust . . . MIMESA.
 (25) 26. Anterior and posterior basal transverse nervures almost in one direction; posterior calcaria very fine . . . PSEN.
 (12) 27. Abdomen sessile, or, if petiolated, petiole formed by the narrowing of the base of both dorsal and ventral plates of the segment.
 (35) 28. Abdomen not largely and deeply punctured, or, if so, with the propodeum spinose.
 (32) 29. Second submarginal cell petiolated.
 (31) 30. Pronotum elongate . . . DIDINEIS.
 (30) 31. Pronotum very short . . . NYSSON.
 (29) 32. Second submarginal cell not petiolated.
 (34) 33. Both recurrent nervures received in the second submarginal cell . . . GORYTES.
 (33) 34. First recurrent nervure received in the first submarginal cell, second in the third . . . MELLINUS.
 (28) 35. Abdomen largely and deeply punctured; propodeum simple.
 (37) 36. Second submarginal cell petiolated . . . CERCERIS.
 (36) 37. Second submarginal cell not petiolated . . . PHILANTHUS.
 (1) 38. Anterior wings with only one submarginal cell.
 (40) 39. Metanotum with a curved spine at the base . . . OXYBELUS.
 (39) 40. Metanotum simple.
 (42) 41. Eyes hairy . . . ENTOMOGNATHUS.
 (41) 42. Eyes glabrous . . . CRABRO.

ASTATUS, Latr.

A very distinct genus, which can only be confused with *Tachytes*, but the eyes of the male are very large, and meet on the vertex, and the central ocellus is much larger than the others. The mandibles are simple in both sexes; the

basal joint of the antennæ is very thick, and the nerve which separates the first and second submarginal cells is angulated and spurred on its inner margin; the propodeum is elongate, and reticulated or finely rugose; abdomen short and wide, somewhat cordiform, ♂ with penicilli on the eighth dorsal valve, ♀ with the sixth dorsal valve short and triangular; tibiæ with two calcaria. The species of this genus are most active, and will generally, when disturbed, make a quick, circuitous flight, and return almost to the identical spot from which they rose.

F. Smith and Shuckard both record the ordinary prey of *A. boops* for the sustenance of its larvæ to be the larvæ of a species of *Pentatoma*, but Smith has also observed it carrying home specimens of *Oxybelus*. Shuckard, on Smith's authority, says *Epeolus*, but this mistake Smith corrects in his Fossorial Hymenoptera, p. 96, pointing out that the species was certainly *Oxybelus uniglumis*. *A. stigma* is so rare that nothing is known of its habits.

- | | | | | | |
|-----|----|---------------------------------------|---|---|---------|
| (2) | 1. | Larger; metanotum clathrately rugose | . | . | BOOPS. |
| (1) | 2. | Smaller; metanotum finely reticulated | . | . | STIGMA. |

A. boops, Schr.—Head and thorax black; eyes in the male enormous, occupying the whole sides and vertex, face in both sexes clothed with silvery hairs, vertex in the ♀ shining and remotely punctured, in both sexes with long whitish pubescence posteriorly, and with the central ocellus larger than the others, second joint of labial palpi dilated triangularly, antennæ with the basal joint very large and thick, flagellum gradually narrowing to the apical joint, which is finely pointed; mesonotum finely punctured ♂, very shining and remotely punctured ♀, scutellum very shining in both sexes, propodeum elongate, reticulated somewhat in longitudinal lines, rather densely clothed at the sides, especially in the ♂, with fine white hairs, wings smoky near the apex, especially near the costal margin, abdomen exceedingly finely rugulose, with

the first, second, and base of the third segments red, the rest black; segments in the ♂, especially towards the apex, pilose beneath; legs black, tibiæ finely spinose.

L. 10–12 mm.

On sandy commons, &c., in the hottest sunshine; July and August; not rare, but local. Chobham; Southwold. Coombe Wood; Hawley, Hants; Reigate Heath; Corton Common, nr. Lowestoft; (*F. Smith*). Sidmouth; (*R. C. L. Perkins*). Hastings; Bexhill; (*Frisby*). Bournemouth; I. of Wight; (*Rothney*). Lulworth; Studland; Parley Heath; (*Dale*). Norfolk; (*Bridgman*). Portlemouth and Bolthead, Devon; (*Bignell*).

A. stigma, *Panz.*—Smaller than *boops*, but similarly coloured; central ocellus scarcely larger than the others; face in the ♂ with a bilobate white spot just below the ocelli; second joint of labial palpi in both sexes not triangularly dilated; head in ♀ dull, exceedingly finely rugulose, and with scattered shallow punctures; mesonotum closely punctured ♂, very shining ♀, with very remote large punctures, scutellum and postscutellum very shining, propodeum quite dull, and very finely rugose; abdomen exceedingly finely rugulose, not pilose beneath in either sex.

L. 7–8 mm.

On sandy commons, &c., July, August; very rare. Chobham; Woking; Littlehampton; Hayling Island. Weybridge; Deal; Barmouth; (*F. Smith*). Wallasey; (*Gardner*). Southport; (*B. Cooke*).

TACHYTES, *Panz.*

This genus is an extensive one, and appears to be almost cosmopolitan. It has been divided by Kohl into two, *Tachytes* and *Tachysphex*, the former having the terminal dorsal valve of the abdomen clothed with golden hairs, the

latter having it glabrous. Our three species belong to this second division.

Tachytes in its broader sense may be distinguished from the allied genera with the mandibles emarginate beneath, by having three submarginal cells in the anterior wings; it also has, as a rule, the marginal cell appendiculated; the eyes are large, and are more approximate on the vertex in the ♂ than in the ♀, but they never meet, as in *Astatus*, the two posterior ocelli are situated on an elevation, and are flat and more or less indefinite and transverse; the second submarginal cell receives both recurrent nervures, and the third is very long and narrowly produced at its lower apical angle, the pronotum is short, and at a much lower level than the mesonotum; the abdomen is ovate, and not petiolated, and that of the ♀ has a distinct pygidial area; the anterior tarsi in the ♀ are longly pectinated. The species always prey on the larvæ of *Orthoptera*, according to Continental authorities, and Smith has taken *T. pectinipes* "at Weybridge with a small species of grasshopper." Shuckard, on the other hand, says he has "frequently caught it with a small sandy-coloured caterpillar."

We have three British species.

- | | | | |
|-----|----|--|-------------|
| (2) | 1. | Abdomen entirely black | UNICOLOR. |
| (1) | 2. | Abdomen red at the base. | |
| (4) | 3. | ♂ with the face above the mandibles silvery;
♀ anterior tibiæ entirely black; apical
dorsal valve of abdomen very long and
pointed | PECTINIPES. |
| (3) | 4. | ♂ with the face above the mandibles golden;
♀ anterior tibiæ yellow beneath; apical
dorsal valve of abdomen shorter in pro-
portion to its length | LATIVALVIS. |

T. unicolor, *Panz.*—Entirely black, head finely and closely punctured, with a deep impression between the ocelli; clypeus clothed with bright silvery hairs in both sexes, and also the face to above the antennæ in the ♂; mesonotum slightly shining, closely and deeply punctured, pro-

podeum dull, finely rugose, and clothed with whitish hairs, especially at the sides, which are finely strigose, wings slightly dusky in the ♀; abdomen finely but clearly punctured, segments depressed at the apex and with a lateral apical spot of silvery hairs visible only in certain lights; apical dorsal valve rounded in the ♂, smooth and elongately triangular in the ♀, with a few shallow punctures; tibiæ with a few stout spines, tarsi piceous at the apex, anterior pair in the ♀ very longly pectinated.

L. 8-9 mm.

Rare. Chobham; Hayling Island; Ilfracombe. Sandown Bay, Isle of Wight; Sandhurst; Weybridge; Deal; (Smith). Ventnor; (Rothney). Portland; Lulworth; (Dale). June to August.

T. pectinipes, Linn. (*pompiliformis*, Smith).—Black, the two basal segments of the abdomen red; head finely punctured, distance between the eyes on the vertex longer than the first two joints of the flagellum, impressed behind the ocelli, clypeal region clothed with golden silvery hairs; mesonotum closely punctured, propodeum finely rugose, its sides strigose, and clothed with silvery hairs, wings slightly smoky, marginal cell with a distinct appendix; abdomen with the apices of the segments less deeply impressed than in *unicolor*, and the puncturation much closer and finer, sides of the segments with an apical patch of silvery hairs, terminal dorsal valve in the ♂ truncate, in the ♀ very elongate and triangular, more than twice as long as its basal width, its sides raised, and the disc very largely and remotely punctured; legs black, clothed with silvery hairs, tibiæ with a few short spines, anterior tarsi very longly pectinated in the ♀.

L. 8-9 mm.

Common on sandy commons, &c., and generally distributed.

T. lativalvis, Thoms.—Exceedingly like *pectinipes*, but the ♂ has the face densely clothed with bright golden

pubescence up to the ocelli, the eyes are closer together on the vertex, the distance between them not being longer than the first and second joints of the flagellum together; the mesonotum is more strongly punctured and its sides more or less clothed with golden pubescence; anterior tibiæ and femora pale in front; it is also rather larger than *pectinipes*; the ♀, which I have never seen, is said to differ from that of *pectinipes* in having the anterior tibiæ pale in front, and the apical dorsal valve shorter, not being more than once and a half as long as wide.

L. 9–10 mm.

One ♂, Sandhills, Deal. August, 1882.

DINETUS, Jur.

Allied to *Tachytes*. Eyes slightly convergent towards the vertex, ocelli round and distinct, mandibles with a deep sinuation on their lower margin with a blunt tooth on its basal side, antennæ in the ♂ spirally twisted in the middle; wings with the marginal cell abruptly truncate at the apex, and widely appendiculated and with only two submarginals, the second small, and subtriangular, each receiving a recurrent nervure; propodeum and abdomen much as in *Tachytes*; tibiæ and tarsi spinose, anterior tarsi pectinated.

There is only one European species of this genus.

D. pictus, *Fab.*.—Head black, very closely punctured, with a streak behind each eye, and the mandibles in both sexes flavous, in the ♂ the entire face and antennæ are of this colour; thorax black and punctured like the head, collar, tubercles, tegulæ, scutellum, and postscutellum flavous, propodeum finely rugose, with a wide line of silvery pubescence on each side; abdomen with the first three segments flavous in the ♂ with their apices brown, testaceous red in the ♀, the second and third with a small lateral spot at the apex, fourth and fifth segments in the ♂ brown, the latter with a pale apical spot, the sixth and seventh

flavous, ♀ with the last three segments black, the fourth with a lateral spot at the apex, fifth with a pale apical band, and sixth with a triangular apical spot, extreme apex testaceous brown; legs flavous in the ♂, except the black posterior femora, ♀ with the femora black except a white spot at the apex of the first and second pairs beneath, tibiæ and tarsi whitish, the former black inwardly.

L. 8 mm.

Exceedingly rare. Smith records it from Windsor and Ascot, but it has not been taken for many years.

MISCOPHUS, Jur.

Closely allied to *Tachytes*, but easily recognizable by the smaller size of the species, by the three round ocelli, the posterior pair not raised on an elevation as in that genus, and the petiolated second submarginal cell in the anterior wing which only receives the second recurrent nervure. According to Giraud and Smith *M. bicolor* provisions its nests with spiders. The species frequent sandy commons, sand-hills, &c., and are excessively active and difficult to catch. There are only two British species. Kohl, in 1884, records eleven species, of which ten are Palearctic and one Neotropical.

- (2) 1. Head and thorax black, abdomen in the ♀
and rarely in the ♂ more or less red at the
base CONCOLOR.
(1) 2 Head and thorax bronzy black; ♀ abdomen
entirely black MARITIMUS.

M. concolor, Dahlb. (*bicolor*, Smith, Saund., etc., nec Jurine).—Black, ♂ sometimes with the first abdominal segment more or less red, ♀ with the first or with the first and second red. Head dull, closely punctured, face without a central impressed line, mesonotum closely but not quite so finely punctured as the head, more or less shining, mesopleuræ shining, very shallowly punctured, scutellum punc-

tured like the rest of the mesonotum, propodeum with a raised central line and a series of divergent rugosities extending from its base, sides of the thorax and the apices of the abdominal segments laterally clothed with silvery hairs, abdomen punctured, legs clothed with silvery hairs beneath.

L. 4-6 mm.

Chobham; Woking; on sandy commons; not rare but difficult to catch. Coombe Wood; Sandhurst; Weybridge. It provisions its nest with a small white-bodied spider, which is found commonly on heath (*Smith*).

This is evidently not the *bicolor* of Continental authors, of which Kohl describes the mesopleuræ as "*densissime punctatæ*," which they certainly are not in the British species; the Continental species is also larger, and the abdomen in the ♀ has often three segments at the base red, and that of the ♂ two. I feel little doubt that it is Dahlbom's *concolor*.

M. maritimus, *Smith*.—Entirely bronzy black in both sexes, and further distinguishable from *concolor* by the impressed line which runs from the ocelli to the insertion of the antennæ, and by the somewhat longer propodeum; the ♀ may be also known by the intensely fine close puncturation of the head, and both sexes by the duller, more deeply punctured mesopleuræ. The face in the ♀ is very decidedly bronzy.

L. 4-6 mm.

Rare. The only locality I know for it is on the Deal sandhills, where it has been taken by Mr. F. Smith, the Rev. F. D. Morice, and myself.

TRYPOXYLON, Latr.

This genus may be easily known by its long narrow abdomen and the peculiar neuration of the wings. The mandibles are simple, the eyes deeply sinuate on their

inner margins. The antennæ are rather short, sometimes slightly thickened towards the apex; the anterior wings have two submarginal and three discoidal cells, but the second submarginal and third discoidal are enclosed by such very fine pale nervures, that at first sight they are liable to be overlooked; propodeum rather short, abdomen very long and narrow, its first segment channelled at the base, apical segment in the ♀ with no distinct pygidial area; tibiæ and tarsi not spinose.

The species of the genus nest in the ground, or in decayed wood or bramble stems, and provision their nests with spiders; their cocoons are tough and leathery. Smith says that the cocoons of *T. figulus* are separated from each other by a partition of agglutinated sand.

Kohl, in 1884, gives seventy-four described species of this genus, and says it occurs in all regions; there are seven Palearctic species, of which we have three.

- | | | | |
|-----|----|---|-------------|
| (4) | 1. | Petiole broader, first segment of abdomen not nearly twice as long as the second. | |
| (3) | 2. | Larger, legs entirely black | FIGULUS. |
| (2) | 3. | Smaller, anteriortibiæ pale, at least in front | CLAVICERUM. |
| (1) | 4. | Petiole very narrow, first segment of abdomen twice, or nearly twice, as long as the second | ATTENUATUM. |

T. figulus, Linn.—Black, clothed with short cinereous pubescence, mandibles red at the apex. Head dull, exceedingly closely punctured, face between the eyes nearly flat, clypeus with a slight sinuation in the centre, antennæ scarcely clavate, the apical joint in the ♂ acuminate, as long as the preceding two united; thorax finely punctured, wings dusky at the apex, propodeum diagonally rugose, channelled down the centre; abdomen with the basal segment raised at the apex, not quite one-half longer than the second, all the segments especially in the ♂ with an apical band of gray pubescence, widest at the sides, apical segment in the ♀ pilose beneath; legs black,

sides towards the body clothed with shining sericeous pubescence.

L. 8-12 mm.

Very common and generally distributed; appears in May and June.

T. clavicercum, *Lep.*.—Smaller than *figulus*, face convex between the eyes, clypeus bidentate in the centre, antennæ distinctly clavate, apical joint in the ♂ not acuminate; tegulæ pale; anterior tibiæ entirely pale or pale only in front, all the knees pale.

L. 6-8 mm.

Common and generally distributed.

T. attenuatum, *Smith.*.—Much narrower and more elongate than either of the preceding and distinguishable at once by the long thin basal segment of the abdomen, which is twice as long as the second. In colour and in the form of the antennæ it more resembles *figulus*, but the apical joint is longer in the ♂ of this species, being equal to the four preceding together; the puncturation of the mesonotum is much finer, and the form of the abdomen much more elongate, each segment being longer than wide.

L. 8-9 mm.

Not rare; it may be bred from bramble stems. Chobham; Woking; Reigate. Bristol; (*Smith*). Near Hastings; (*Frisby*). Bickleigh; Exminster; (*Bignell*). Norfolk; (*Bridgman*). Gloucestershire; (*V. R. Perkins*).

AMMOPHILA, Kirb.

Distinct from our other *Sphegidæ* by the long round petiole of the abdomen; this is composed only of the lower plate of the first abdominal segment. Head rather large, mandibles not sinuate on their lower margin, tongue elongate and bifid; eyes entire, ocelli round and rather close together; pronotum rather elongate, convex, separated from

the mesonotum by a deep division, propodeum elongate, wings with three submarginal cells; abdomen varying much in the length of the petiole, apical dorsal valve in the ♀ without a distinct pygidial area; legs with the tibiæ more or less spinose, tarsi densely so, anterior tarsi pectinated in the ♀.

This is an extensive and almost cosmopolitan genus, of which only four species occur in this country; these form their nests in the ground, provisioning them with spiders or caterpillars according to the species.

The British species of this genus may be divided into three subgenera, as shown in the following table of species:—

- | | | | |
|-----|----|--|-------------|
| (4) | 1. | Petiole of abdomen very long, the first segment scarcely widened at the apex. | |
| (3) | 2. | Third submarginal cell not petiolated (Subg. <i>Ammophila</i> , Kirb) | SABULOSA. |
| (2) | 3. | Third submarginal cell petiolated (Subg. <i>Miscus</i> , Jur.) | CAMPESTRIS. |
| (1) | 4. | Petiole of abdomen not very long, the first segment largely widened at the apex. (Subg. <i>Psammophila</i> , Dahlb.) | |
| (6) | 5. | Propodeum rugose not diagonally striate | HIRSUTA. |
| (5) | 6. | Propodeum diagonally striate | LUTARIA. |

A. sabulosa, *Linn.*—Black, the apex of the first, the whole of the second, and the base of the third abdominal segment red, with a black dorsal spot on the first and second in the ♂; head and thorax clothed with pale hairs, face very narrow and golden pubescent in the ♂; mesonotum rugosely punctured, anterior wings dusky at the apex, with the third submarginal cell trapezoidal or triangular, not petiolated, propodeum irregularly rugose; abdomen clothed with a fine glaucous pubescence, first segment with a very long glabrous petiole, only widening slightly posteriorly after its juncture with its dorsal valve, the rest of the abdomen elongate oval, about as long as the first segment, apical ventral valve in the ♀ hairy at the sides, armature of the ♂ with the stipites towards the apex fringed inwardly

with a series of long bristles; legs with the tibiae scarcely spinose, tarsi rather densely so.

L. 18-22 mm.

Common in most sandy situations in the south, and recorded from Lancashire (*W. Gardner*). I have, however, no other northern or midland localities for it. It provisions its nest with caterpillars.

(*SEEG. MISCUS*, Jur.)

A. campestris, *Latr.*—Exactly like the preceding in general form and colour, but differing in having the third submarginal cell almost always petiolated and in having the propodeum very finely, regularly, and diagonally strigose, the striae meeting along the centre, the colour of the ♀ is darker than that of *sabulosa* and more pruinose.

L. 15-20 mm.

In similar localities with the preceding, but generally rarer; abundant, however, on the sandy commons about Woking, Chobham, and Weybridge; provisions its nest with caterpillars.

(*SEEG. PSAMMOPHILA*, Dhlb.)

A. hirsuta, *Scop. (viatica, Smith)*.—Black, first segment of abdomen posteriorly, the second and the base of the third red. Head and thorax largely and rugosely punctured, clothed with black and gray hairs in the ♂, or black only in the ♀, face in the ♂ more or less silvery; propodeum rugose, not diagonally striate, wings slightly smoky in the ♂ with an apical cloud; first segment of the abdomen much widened posteriorly, the petiole hairy above and beneath, rest of the abdomen much longer than the petiole, clothed in the ♂ with fine pruinose pubescence; all the tibiae spinose, and the tarsi strongly so, coxae and trochanters densely hairy.

L. 15-20 mm.

Common in sandy localities in the south; provisions its nest with spiders.

A. lutaria, *Fab. (affinis, Kirb.)*.—Rather smaller than the preceding and recognizable at once by the diagonally striate propodeum, and the almost glabrous petiole of the abdomen; the head and thorax are less closely punctured, and it is not such a densely hairy insect.

L. 14–18 mm.

Rarer than the preceding. Littlehampton; Hayling Island; Chobham; Southend; Deal; Lowestoft; Coast of Hampshire; (*Smith*). St. Osyth; (*Harwood*). Norfolk; (*Bridgman*).

SPILOMENA, Shuck.

(*Celia, Shuck.*)

The only European species of this genus one of the smallest of our Aculeate Hymenoptera, and recognizable from all but the species of the next genus by the very large stigma of the anterior wings; head large, subquadrate on the vertex, mandibles in the ♂ bidentate at the apex; pronotum short and collar like, mesonotum with a deep channel in front of the scutellum, anterior wings with two submarginal cells and only one recurrent nervure which unites with the first submarginal nervure, propodeum rather elongate; abdomen subelliptic, its petiole short but formed of the ventral valve only of the first segment, as in *Ammophila*; eighth ventral valve in the ♂ with a short straight process; tibiæ not spinose. Goureau says it provisions its nest with *Coccus vitis* *Linn.*, and that it captures them almost as they leave the egg.

S. troglodytes, *V. de Lind.*.—Black, the mandibles and scape of the antennæ in front in both sexes and the clypeus and sides of the face, and sometimes the entire antennæ tegulæ and legs in the ♂ flavous. Head and mesonotum very finely punctured, the latter with two

short impressed lines in front, wings hyaline, nervures pitchy, propodeum rugose, with two longitudinal raised lines down the centre, transversely striated between them; abdomen shining, apparently impunctate, legs with the tibiæ and tarsi more or less pale.

L. $2\frac{1}{2}$ –3 mm.

Woking; Charlwood, Surrey. London District; Charlton, Kent; burrowing in hard white sand; (*Smith*). Plympton; Horrabridge; Bickleigh, bred from bramble stems, 6th June; (*Bignell*). Oxford; (*R. C. L. Perkins*). Glanvilles Wootton; Portland; in flowers (*Dale*). Rugby; (*Morice*). Minton; Bridgenorth; Eotusfleming; (*Marshall*).

STIGMUS, Jur.

Closely allied to *Spilomena* in form, but larger, the anterior wings having like it two submarginal cells, and only one recurrent nervure, but this latter is received into the first submarginal at a considerable distance from its apex; the stigma is very large; the abdomen is more longly petiolated than in *Spilomena*, and in the ♂ the apical ventral valve has a pale straight process. There is only one recorded British species, which is clearly referable to *Solskyi* of Morawitz, and not to *pendulus* of Panzer as hitherto supposed. It seems doubtful whether *Stigmus* is a parasitic genus, or whether, like its allies, it provisions its nest with *Aphides*.

S. Solskyi, *Moraw.* (*pendulus*, *Smith*, *Shuck.*, *Saund.*, &c.).—Black, antennæ, mandibles, tubercles, tegulæ, apices of the femora, anterior and intermediate tibiæ, and the base and apex of the posterior tibiæ and all the tarsi testaceous; face clothed with silvery hairs in the ♂, clypeus produced in the centre and notched in the ♀; pronotum short, longitudinally striate, mesonotum microscopically strigose longitudinally, with two short impressed lines in front, transverse impression in front of the scutellum crenate,

wings hyaline, nervures piceous, stigma very large, black, mesopleuræ rugose on their upper half, propodeum rugose, with three raised longitudinal lines and transversely rugose between them; abdomen very smooth and shining, its petiole rugose and longer than the rest of the first segment; posterior tibiæ with two or three spines.

L. 4-6 mm.

Not very common. Chobham; Tunbridge Wells. London District; (*Smith*). Glanvilles Wootton; Portland; (*Dale*). Rugby; (*Morice*). Norfolk; (*Bridgman*). Gloucester; (*V. R. Perkins*). Bridgenorth; (*Marshall*).

PEMPHREDON, Latr.

(*Cemonus*, Jur. *Ceratophorus*, Shuck.)

The species of this genus are very closely allied and difficult to distinguish from one another; they can be separated from those of either of the preceding genera by the presence of a second recurrent nervure, from *Mimesa* and *Psen* in having only two submarginal cells, and from the other allied genera by the long hairs on the head and thorax; the petiole of the abdomen, as in the surrounding genera, is formed of the ventral plate only of the first segment and is of considerable length, generally as long or longer than the rest of the segment. I have followed Kohl and Thomson in uniting *Ceratophorus* with this genus. The species provision their nests with *Aphides*; the larvæ spin no cocoon.

- | | | | |
|-----|----|---|-----------|
| (8) | 1. | Face between the antennæ simple. | |
| (3) | 2. | Each submarginal cell receiving a recurrent nervure (Subg. <i>Pemphredon</i> , Latr.) | LUGUBRIS. |
| (2) | 3. | First submarginal cell receiving both recurrent nervures (Subg. <i>Cemonus</i> , Jur.). | |
| (5) | 4. | Smooth space on the propodeum widely lunulate, its posterior margin not strongly defined; apex of the clypeus in the ♀ scarcely produced in front, not raised | LETHIFER. |
| (4) | 5. | Smooth space on the propodeum narrowly lunulate; its posterior margin strongly | |

- defined, clypeus in the ♀ emarginate, or produced and raised at the apex.
- (7) 6. Mesonotum less strongly punctured, ♀ with the clypeus produced in the centre and slightly raised SHUCKARDI.
- (6) 7. Mesonotum more strongly punctured, ♀ with the clypeus deeply emarginate WESMAELI.
- (1) 8. Face between the antennæ with a blunt process (Subg. *Ceratophorus*, Shuck.) MORIO.

(SUBG. PEMPHREDON.)

P. lugubris, *Latr.*—Entirely black, very variable in size; head rugosely punctured, clothed with long hairs, especially in the ♂, vertex subquadrate, slightly narrowed behind in the ♂, clypeus rounded in front in the ♀ and very largely punctured, in the ♂ densely clothed with silvery hairs, mesonotum clothed with long hairs, rugose, or very rugosely punctured, wings slightly dusky ♂, more strongly so ♀, first and second submarginal cells each receiving a recurrent nervure, propodeum clothed with silvery hairs, rugose, with a dull finely rugose lunulate elevation posteriorly; petiole of the abdomen curved, rugose, hairy above and below, rest of the abdomen shining, clothed with fine hairs in the ♂, but in the ♀ hairy only near the apex and beneath, apical dorsal valve in the ♀ with two raised parallel lines; posterior tibiæ in the ♀ with a few short spines.

L. 9–12 mm.

Var. *luctuosa*, Shuck., of which I possess the type, is only a variety of this species, with the raised portion of the propodeum more or less shining and smooth.

Very common; found usually basking in the sun on leaves; makes its nest in wooden posts, &c.

(SUBG. CEMONUS.)

P. Shuckardi, *Moraw.* (*unicolor*, *Thoms.*, *unicolor pars Shuck., Smith, Saund.*).—Usually smaller than *lugubris*, and differing from it in the arrangement of the nervures of the wing, the first submarginal cell receiving both recurrent

nervures ; the head and thorax in both sexes are more shining and the puncturation sparser, large and shallow, post-scutellum shining, largely punctured ; in the ♀ the disc of the mesothorax is very remotely punctured ; the clypeus in the ♀ is produced in the centre, and slightly elevated at the apex, the labrum produced beyond it and widely channelled, the elevated apex of the clypeus can be easily seen from the side ; the lunulate raised area of the propodeum is narrow, well defined on both edges, subparallel-sided, shining and polished, the legs also are less hairy ; the posterior tibiæ in the ♀ have outwardly a few short irregular spines.

L. 6-10 mm.

Common everywhere ; usually seen basking on currant, raspberry or bramble leaves.

P. Wesmaeli, *Morav.* (*lethifer*, *Thoms.*, *unicolor* pars *Shuck.*, *Smith*, *Saund.*).—Exceedingly like *Shuckardi*, but slightly larger and more robust. Head and mesonotum much more largely, closely, and deeply punctured, post-scutellum dull, closely and rugosely punctured, clypeus in the ♀ not raised, or produced, but with its apical margin deeply emarginate, vertex of the head not narrowed behind.

L. 7-11 mm.

Under *unicolor* in Shuckard's collection both this species and the preceding are mixed, and they will probably be found mixed in most collections.

L. 7-11 mm.

P. lethifer, *Shuck.*.—Distinguished from any of the preceding, by the form of the polished lunulate area of the propodeum ; this is widened in the centre posteriorly, and less distinctly margined ; that is to say the punctures along the posterior margin are not so crowded as in the other species, and the polished area seems to be less raised above its punctured surroundings ; the clypeus in the ♀ is very slightly produced in the centre but not raised, and the posterior tibiæ are almost devoid of spines.

L. 6-10 mm.

Very common; may be bred freely from bramble stems. I possess the type of this species from Shuckard's collection.

(SUBG. CERATOPHORUS.)

P. morio, *V. d. Lind. (anthracinus, Smith)*.—Readily distinguished from any of the preceding by the slightly raised sides of the face and its excavated centre, as well as by the blunt process between the antennæ, and the much shorter petiole of the abdomen; in the ♂ the face is not clothed with silvery hairs below the antennæ, and the third, fourth, and fifth ventral segments of the abdomen have a fringe of semi-erect hairs near the middle; in the ♀ the clypeus is semicircularly-emarginate, the emargination simple, not toothed in the centre; labrum widely channelled; tibiæ neither spined nor toothed.

L. 6-7 mm.

Rare. London District; Devonshire; (*Smith*). Battersea Fields; (*Shuckard*). Parley Heath; (*Dale*).

I have carefully examined the type of *Smith's anthracinus*, kindly lent to me by Dr. P. B. Mason, and fail to see any character in it of specific value. All the females I have seen seem to agree with Thomson's description of his *carinatus*, but the males with that of his *clypealis*.

DIODONTUS, Curt.

The species of this genus, with the exception of large examples of *tristis*, are smaller than those of *Pemphredon*, and may be known also by the much shorter petiole, the abdomen being nearly sessile; the labrum is produced and emarginate at the apex; the clypeus is tridentate in the ♀; bidentate and densely clothed with silvery hairs in the ♂; the wings have two submarginal cells, and the propodeum is reticulately rugose; the abdomen is oblong ovate,

narrower in the ♂, in which sex the apical ventral valve terminates in an elongate process; the pygidial area in the ♀ is clearly defined; tibiæ more or less spinose outwardly. Kohl gives seven European species, of which three have been recorded from this country; these burrow in banks, and provision their nests with *Aphides*.

- | | | | |
|-----|----|---|----------|
| (2) | 1. | Mandibles flavous | MINUTUS. |
| (1) | 2. | Mandibles black. | |
| (4) | 3. | Tubercles black in both sexes; transverse impression in front of the scutellum simple | LUPERUS. |
| (3) | 4. | Tubercles partly pale in the ♂; transverse impression in front of the scutellum crossed by longitudinal costæ | TRISTIS. |

D. minutus, Fab.—Black; mandibles, underside of the antennæ in the ♂, tegulæ, tubercles, apex of the femora, base of the tibiæ, and the entire anterior tibiæ and tarsi, except a posterior streak, and in the ♂ the intermediate and posterior tarsi, and often the entire tibiæ, pale yellow or testaceous; the markings in the ♂ brighter and paler than in the ♀. Head and thorax dull, very finely rugulose, punctured, the latter less closely than the former, impression in front of the scutellum simple, propodeum clathrately rugose; abdomen shining, exceedingly finely punctured, posterior segments clothed with short greyish pubescence, apical dorsal valve in the ♀ with very large remote punctures, ♂ with the apex of the abdomen more or less pale; tibiæ very slightly and irregularly dentate in the ♀, with spinose hairs in the ♂, anterior and intermediate metatarsi in the ♂ curved, the latter angularly produced beneath.

L. 4-6 mm.

Common, burrowing in sandy banks; occurs from May to the end of the season.

D. luperus, Shuck.—Head, thorax, and abdomen entirely black in both sexes; legs with the base and apex of all the tibiæ, and the front of the anterior pair, and all the tarsi in the ♂ more or less pale, the pale colour brighter and

more extensive in the ♂ ; in the ♀ the anterior tarsi are piceous ; the surface of the head and thorax is moderately shining and finely punctured, the intervals between the punctures rather strongly aciculate, transverse impression in front of the scutellum simple in the ♀ , or with one or two transverse costæ in the ♂ , but not regularly costate as in *tristis* ; abdomen less finely punctured than in *minutus*, the apical dorsal valve in the ♀ narrower, with more reflexed edges.

L. 5-7 mm.

Widely distributed, although not recorded from many localities. Woking ; Deal ; Hayling I. ; Southwold. Bury St. Edmunds ; (*W. H. Tuck*). Exeter ; (*Parfitt*). Norfolk ; (*Bridgman*). Gloucestershire ; (*Perkins*). Niton ; Sandwich ; (*Marshall*).

D. tristis, *V. d. Lind.*.—Larger than either of the preceding ; ♂ with the surface of the head and thorax shining, not aciculate, but much more coarsely punctured than in *minutus* or *luperus* ; tubercles in part, and tegulæ pale ; anterior tibiæ in front, the tarsi, and the base and apex of all the tibiæ pale.

♀ almost as large as *Pemphredon Shuckardi* ; entirely black, except the calcaria, and occasionally the base of the tibiæ and the basal joint of the tarsi, which are piceous ; mesonotum shining, remotely punctured on the disc, closely in front, among the punctures are some slight, very irregular longitudinal striæ, transverse impression in front of the scutellum with strong transverse costæ ; apical dorsal valve of abdomen wider than in *luperus*, its sides less raised, very largely punctured, sometimes with its extreme apex piceous.

L. 6-9 mm.

Generally distributed, and usually common.

PASSALÆCUS, Shuck.

Species much resembling those of *Diodontus* in general appearance but more elongate, the mandibles straight on their exterior margin, the labrum produced and pointed; thorax twice, or nearly twice, as long as wide, the propodeum elongate and finely reticulated; abdomen subparallel-sided in the ♂, elongate oval in the ♀, the second segment slightly constricted at the base, apical ventral valve in the ♂ with an upturned curved process, apical dorsal valve in the ♀ without a pygidial area; posterior tibiæ without spines. Four species are recorded from the British Isles; they make their nests in pierced bramble stems and decaying wood.

- | | | | |
|-----|----|---|---------------|
| (4) | 1. | Mesopleuræ with two transverse crenatures at right angles to the perpendicular one. | |
| (3) | 2. | Mesonotum simply punctured, anterior longitudinal impressions simple, face with a spine between the antennæ | CORNIGER. |
| (2) | 3. | Mesonotum coriaceous, anterior impressions crenate, face without a distinct spine | INSIGNIS. |
| (1) | 4. | Mesopleuræ with only one transverse crenature. | |
| (6) | 5. | Labrum and tubercles black. | GRACILIS. |
| (3) | 6. | Labrum and tubercles white. | MONILICORNIS. |

P. corniger, Shuck. (♀ nec ♂) (*insignis*, Shuck., Smith, ♂ nec ♀).—Black, tubercles yellow; mandibles, palpi, and basal joint of the antennæ in front flavous in the ♂, testaceous in the ♀, tibiæ, tarsi and the extreme apices of the femora testaceous, the posterior tibiæ clouded in the middle; head and thorax finely punctured, somewhat shining, the former with the vertex square, face below the antennæ with silvery hairs, between the antennæ armed with a sharp spine; mesonotum with its lateral margins crenate, in front with two impressed lines, not quite reaching its centre, and with two smooth, slightly-raised lines between them, dorsal line narrowly impressed, impression in front of the scutellum crenate, mesopleuræ

with a perpendicular crenature in front, from which are emitted posteriorly two horizontal ones, propodeum elongate, clathrate; abdomen shining, finely and rather closely punctured.

L. 6-7 mm.

On flowers of *Rubus*, &c. London District; (*Smith*), Colchester; (*Harwood*). Rugby; (*Morice*). Exeter; (*Parfitt*). Norfolk; (*Bridgman*). Hastings. Gloucester; (*V. R. Perkins*).

P. insignis, *V. d. Lind.* (*corniger* ♂ *nec* ♀, *Shuck. and Smith*).—Smaller and less elongate than the preceding; mesonotum more rugosely punctured, the anterior impressions longer, strongly crenate, especially in the ♂, and the posterior margin of the mesonotum also slightly crenate in the ♀, strongly in the ♂; the tubercles are black or pale in the ♂, pale in the ♀; mandibles in the ♂ often black; in the ♀ there is a slight tubercular spine between the antennæ.

L. 5-6 mm.

Widely distributed and not rare, but not recorded from Scotland or Ireland.

P. gracilis, *Curt.*—This species may be at once known from either of the preceding by the single transverse crenature of the mesopleuræ. The tubercles and labrum are black in both sexes, the mesonotum is punctured like that of *corniger*, although not quite so finely, the anterior impressions are very short and inconspicuous, and there is no crenulation on the posterior margin of the mesonotum as in *insignis*.

L. 6-7 mm.

Not rare, and widely distributed. Mr. G. C. Bignell has bred it from the stump of an old apple-tree.

P. monilicornis, *Dhlb.*—Distinctly larger and with a wider mesothorax than *gracilis*, labrum, mandibles, scape of the antennæ in front and tubercles pale in both sexes; mesopleuræ with only one transverse crenature, although in the ♂ there is a second simple transverse impression; in

the ♀ the second submarginal cell is wider, and the second abdominal segment is scarcely constricted at the base.

L. 7-8 mm.

Rare. Chobham. Wallholme, E. Cumberland; (*Bold*). Glanvilles Wootton, Dorset; (*Dale*). Wotton-under-Edge, Gloucester; (*Perkins*). Chippenham, Wilts; (*R. C. L. Perkins*). Rugby; (*Morice*). Ireland; (*Haliday*). Hastings.

MIMESA, Shuck.

Allied to the preceding genera by the character of the petiole of the abdomen, which is formed of the ventral plate only of the basal segment. This is elongate as in *Pemphredon*, from which the neuration of the wings separates it at once, these in this genus having three submarginal cells; posterior wings, with the median nervure forked, the transverse nervure connecting the posterior nervure with it, joining beyond the fork. The antennæ in the ♀ are somewhat thickened at the apex, and in the ♂ of *M. atra* are apparently only twelve-jointed. The vertex of the head is transverse, and much rounded posteriorly at the sides; the propodeum is short, rounded posteriorly, with a more or less defined basal area; abdomen elongate elliptic, apical ventral valve of the ♂ terminating in an elongate upturned process, apical dorsal valve in the ♀ with a distinct pygidial area. The species are closely allied, and often difficult to distinguish apart; they make their nests in holes in wood, straws, or in the ground, and provision them with *Aphides* or other *Homoptera*. We have six British species. André records twelve from Europe and Algeria.

- (6) 1. Abdomen black and red.
- (3) 2. Petiole of the abdomen wide and flat, widening posteriorly in both sexes; third segment in the ♀ entirely black. SHUCKARDI.
- (2) 3. Petiole of abdomen not widening posteriorly in the ♂. Third segment in the ♀ more or less red.
- (5) 4. Mesonotum and mesopleuræ finely and re-

- motely punctured, the latter almost imperceptibly so. BICOLOR.
- (4) 5. Mesonotum and mesopleuræ closely and more coarsely punctured, especially the latter. EQUESTRIS.
- (1) 6. Abdomen entirely black.
- (10) 7. Second submarginal cell receiving both recurrent nervures.
- (9) 8. ♂ antennæ red at the apex beneath, stipites of genital armature blunt at the apex. ♀ apical dorsal valve widely flattened, dull and punctured. UNICOLOR.
- (8) 9. ♂ antennæ entirely black, stipites of armature styliform at the apex. ♀ apical dorsal valve narrow, shining, its sides and centre raised, largely punctured in the depressions. DAHLBOMI.
- (7) 10. Second and third submarginal cells each receiving a recurrent nervure. ATRA.

M. Shuckardi, Wesm. (*equestris*, Shuck., Smith, nec Fab., Curtis).—Head and thorax black, the former very finely punctured, face below the antennæ clothed with silvery hairs, clypeus in the ♀ with a short transverse tubercle, face between the antennæ with a very slightly raised tubercle, antennæ pale beneath; mesonotum clothed with very short pale hairs, finely punctured but not so closely as the head, wings hyaline, propodeum deeply channelled posteriorly with an enclosed, longitudinally rugose, basal area, irregularly and somewhat clathrately rugose at the sides, which are clothed with silvery hairs; abdomen finely punctured, petiole black, wide, flat, hairy above and widening towards the apex, rest of the basal segment, except a discal spot in the ♂, and the whole of the second, red, the remaining segments black, clothed with fine silvery pubescence, apical dorsal valve in the ♀ hairy, closely and rugosely punctured, carinated at the sides, ventral process in the ♂ testaceous; legs black, tibiæ with short spines, apical joints of tarsi fulvous.

L. 9–12 mm.

Rare. Southwold. Lowestoft; Hampstead Heath; Sandhurst; Isle of Wight; Yorkshire; (*Smith*). Maidstone;

(*Frisby*). Studland; Parley Heath; N. Forest; (*Dale*). Mousehold and Brundall, Norfolk; (*Bridgman*). Bridge-north; (*Marshall*).

M. equestris, *Fab.*—Differs from the above in the ♀ by having the base and sometimes the whole of the third abdominal segment red; also in both sexes by the more coarsely and closely punctured mesonotum and mesopleuræ, in the narrower, parallel-sided, subcarinated petiole of the abdomen, which in the ♂ is much longer, and in the pale tarsi and occasionally pale base and apex of the tibiæ; in the more strongly developed facial tubercle, and in the ♀ by the longer transverse tubercle, and the slightly reflexed anterior margin, of the clypeus.

L. 7–9 mm.

Apparently rare, but probably confused with the following. Southwold. Perth, N.B.

M. bicolor, *Fab.*—Exceedingly like *equestris* in general form and colour, but with the puncturation of the mesonotum and especially of the mesopleuræ much finer and their surface more shining, the puncturation of the mesopleuræ being scarcely noticeable; the posterior impression of the propodeum is much less deep, and the petiole of the abdomen in the ♀ is much longer, narrower, and more distinctly carinate, but in the males of the two species the petiole is very similar, although rather narrower and more distinctly carinated in this. In the ♀ the anterior margin of the clypeus is not reflexed.

L. 7–9 mm.

Abundant on the sandy commons about Woking and Chobham. Smith says it furnishes its cells with a species of *Tettigonia*, and records it from Hampstead; Erith; Luccomb Chine; Yarmouth; Deal; Dover and Yorkshire. Glanvilles Wootton; Knighton Heath; Studland; (*Dale*). Norfolk; (*Bridgman*). Darenth; (*Marshall*). Delamere; (*B. Cooke*). Some of these localities, however, may possibly apply to the preceding.

M. unicolor, *V. d. Lind.*—Entirely black, except the pale calcaria, apices of the tarsi, and apex of the antennæ beneath; face between the antennæ not tuberculated, but with a smooth raised line extending to the central ocellus, more marked in the ♀ than in the ♂, clypeus in the ♀ not tuberculated, head and thorax rather largely and deeply punctured, clothed with greyish hairs; mesopleuræ shining, very remotely and finely punctured, propodeum with a well-defined triangular, longitudinally rugose, basal area, its sides clathrate and hairy; abdomen shining, finely punctured, carina of the petiole sometimes sulcate, apical dorsal valve in the ♀ dull, flat, very largely and somewhat closely punctured, genital armature in the ♂ with the apices of the stipites blunt, not produced; tibiæ very shortly spinose.

L. 7–8 mm.

Woking, Chobham, common in July and August. Barmouth; Charlton, Kent; entering straws of thatch; (*Smith*). Glanvilles Wootton; Charmouth; Sidmouth; Parley Heath; (*Dale*). Isle of Wight; (*Marshall*).

M. Dahlbomi, *Wesm.*—Colour like that of *unicolor*, but antennæ entirely black.

♂ besides having the antennæ entirely black, has the head and mesonotum more finely punctured, the petiole of the abdomen rather wider and its carina more triangularly excavated, also it has the genital armature with the stipites produced into a styliform process at the apex.

♀ with the carina of the petiole of the abdomen triangularly excavated in the centre, and the apical dorsal valve narrow, shining, much raised at the sides and in the centre, and only punctured between the elevations.

L. 7–8 mm.

Apparently rare. I recorded it from Chobham, in my synopsis from two males taken there, but on re-examination these prove to be *unicolor*, although the petiole is distinctly grooved. Mr. V. R. Perkins takes it in Gloucestershire at

Wotton-under-Edge, and Mr. R. C. L. Perkins has taken it at Oxford. These are the only authentic records I have, but it is probably mixed in many collections with *unicolor*.

M. atra, *Fab.*—Black, shining, much larger than any of the preceding. Head and thorax punctured, finely pilose, face densely clothed with golden hairs, and with a short central spine; wings slightly smoky, second and third submarginal cells each receiving a recurrent nervure, propodeum pilose, clathrately rugose, with a well-defined, longitudinally rugose basal area; abdomen with the petiole long, smooth, somewhat flattened above, with a few long hairs beneath, the rest of the abdomen finely punctured.

♂ with the antennæ, mandibles, palpi, anterior and intermediate legs, except the underside of their femora, reddish yellow, posterior tarsi piceous; antennæ with the scape very much dilated, flagellum compressed and dilated, the eighth, ninth, and tenth joints excavated beneath and serrate; first and second joints of the intermediate tarsi produced at the sides, the former with two acute spines at the apex.

♀ with the apical dorsal valve very largely punctured and carinated at the sides; posterior tibiæ densely spinose, calcaria pale.

L. 10 mm.

Very rare. I know of no recent captures.

I possess a ♀ from Shuckard's collection without note of locality, and F. Smith records a ♂ and ♀ from Hawley, Hants; and mentions that he saw one on a flower near Lowestoft.

PSEN, Latr.

There is only one British species of this genus, which can be known from any of its allies by the long slender calcaria of the hind tibiæ, and by the direction of the lower basal nervure of the anterior wings, which scarcely forms an

angle with the upper basal at their juncture. Median nervure of the posterior wing not forked, cross nervure uniting the posterior nervure with it, joining it before its upward bend; face with a well-developed blunt tubercle between the antennæ. Pygidial area of the ♀ not clearly developed.

P. pallipes, *Panz.* (*atratus*, *Panz.*, *Shuck*, &c.).

Black, antennæ beneath, anterior tibiæ in front, and tarsi testaceous, and the ♂ with the intermediate tarsi also pale. Head closely and rugosely punctured, face below the antennæ clothed with silvery hairs, between the antennæ is a well marked carina, wide posteriorly but sharpened in front where it joins a transverse carina which bounds the antennary cavities in front, antennæ in the ♀ somewhat clavate; mesonotum shining, punctured, wings hyaline, propodeum with a triangular clathrate basal area, sulcate down the centre, sides irregularly strigose; abdomen shining, clothed with short whitish pubescence, especially towards the apex; legs clothed with short adpressed hairs, posterior tibiæ simple, calcaria very long and fine.

L. 6-7 mm.

Common and generally distributed, may be bred from pierced bramble stems. Mr. V. R. Perkins says that in Gloucestershire it breeds in dead elm wood, and is very abundant; Shuckard says it nidificates in sand; it has also been known to nest in straws of thatch; it provisions its nest with *Aphides*.

GORYTES, Latr.

Arpactus, *Panz.*; *Hoplisus*, *Lep.*

I have followed Handlirsch in uniting under *Gorytes*, *Arpactus* and *Hoplisus*, which in my synopsis I treated as distinct genera. The genus thus considered may be easily distinguished from the other *Sphégidæ* by the following characters. Antennæ distinctly longer in the ♂ than in the ♀, often very much so, mandibles not sinuate externally; anterior wings with three sub-marginal cells, none of which

are petiolated; abdomen not petiolated and not deeply constricted between the segments; its puncturation not large and coarse, ♀ with a distinct pecten on the anterior tarsi, the pulvilli large and inflated. The British species, with the exception of *tumidus*, which has a red and black abdomen, are black with yellow bands. Handlirsch describes 121 species of this genus, which appears to occur in all the regions of the globe; there are about forty Palaearctic species, of which six occur in Britain.

- | | | |
|---------|--|--------------|
| (2) 1. | Abdomen red at the base. (Subg. <i>Arpactus</i> , Panz.) | TUMIDUS. |
| (1) 2. | Abdomen not red at the base. | |
| (6) 3. | Second segment of abdomen much produced ventrally and angulated at the base. Cubital nervure of anterior wings not nearly reaching to the apex. (Subg. <i>Gorytes</i> , Latr.) | |
| (5) 4. | Second segment ventrally very largely punctured at the base | MYSTACEUS. |
| (4) 5. | Second segment ventrally not largely punctured at the base | CAMPESTRIS. |
| (3) 6. | Second segment of abdomen not angulated at the base ventrally, cubital nervure of anterior wing extending to the apex. (Subg. <i>Hoplissus</i> , Lep.) | |
| (10) 7. | Basal segment of abdomen not constricted at the apex, its sides nearly straight. | |
| (9) 8. | Band of the second abdominal segment not wider than that of the first | 4-FASCIATUS. |
| (8) 9. | Band of the second abdominal segment much wider than that of the first | LATICINCTUS. |
| (7) 10. | Basal segment of abdomen constricted at the apex, its sides much rounded | BICINCTUS. |

(SUBG. ARPACTUS.)

G. tumidus, Panz. (*Arpactus tumidus*, Auct.)—Black, shining, first and second abdominal segments red; sides of the face, scape of the antennæ in front, clypeus, mandibles, centre of the scutellum, a spot on each side of the second abdominal segment near the apex, and a transverse spot or line across the fifth, milky white; these spots are all liable to variation, and one or more are often absent; antennæ in the ♂ and legs in both sexes testaceous, posterior

femora, and a broad line on the other two pairs above, the apices of all the tibiæ and the entire tarsi pitchy black; head and mesonotum largely and remotely punctured, rather densely clothed with adpressed golden pubescence, wings hyaline, propodeum with a well defined, more or less longitudinally rugose, basal area, carinated in the centre and round its margin, beyond the area laterally clothed with whitish hairs and irregularly striate; abdomen largely and remotely punctured on the basal segments, finely and closely on the third and following, but very largely and remotely on the sixth in the ♀; tibiæ finely spinose.

L. 8-9 mm.

Sandy places in summer. Chobham; Woking; Deal; Southwold; Bournemouth. Barmouth; (*Smith*). Land's End; (*Marguand*). Bristol; Chesil Beach; Lulworth; Charmouth; (*Dale*). Norfolk; (*Bridgman*). Gloucestershire; (*V. R. Perkins*). Maidstone; Hastings; (*Frisby*). Sandwich; Birmingham; (*Marshall*).

(SUBG. GORYTES.)

G. mystaceus, *Linn.*—Black, nearly dull, two spots at the base of the clypeus, a band across the pronotum, the tubercles, the scutellum in the ♀, an interrupted band on the first, an entire band on the second and third, and sometimes a spot on the fourth abdominal segment yellow; tibiæ in the ♂ outwardly yellow, tarsi fuscous, paler at the base, tibiæ and tarsi in the ♀ entirely, and sometimes the apices of the femora fulvous. Closely punctured, the basal segment of the abdomen largely and remotely, more or less strigose at the base in the ♂, the second and following segments, especially in the ♀, more finely. Head, thorax and first abdominal segment clothed with greyish hairs; face silvery in the ♂ below the antennæ, which are very long, reaching to about the middle of the second abdominal segment, those of the ♀ short, not extending

to the apex of the thorax, wings slightly dusky, nervures testaceous, propodeum longitudinally rugose within the basal area, with a deep central channel, outside it clathrate; abdomen widest at the apex of the second segment, which is finely crenate at the base, apical dorsal valve in the ♀ densely clothed with adpressed golden hairs, second segment of the abdomen viewed sideways much deeper than the first, and truncate at the base, first and second dull beneath in the ♀ and densely clothed with short adpressed hairs, second largely punctured at the base, the remaining segments shining, in the ♂ all the segments are shining; tibiæ scarcely spined.

L. 12-15 mm.

Common in many places, and generally distributed; frequents umbelliferous plants, &c., in summer.

G. campestris, *Linn.*—(*Fargeii*, *Shuck.*, *Smith*, &c.)—♂ differs from *mystaceus* in having decidedly shorter antennæ, a nearly entirely yellow clypeus, the basal abdominal segment wider, and a yellow band on the fourth segment; tibiæ and tarsi entirely yellow.

♀ with wider abdominal bands than *Mystaceus*, the second segment less widened posteriorly, the tibiæ and tarsi yellower, and the second abdominal segment ventrally with only a few fine punctures at the base.

L. 9-11 mm.

Highbgate; Wandsworth; Battersea; Lowestoft; (*Smith*). Colchester; (*Harwood*). Bristol; (*Thwaites*). Exmouth; (*Parfitt*).

(SUBG. HOPLISUS.)

3. G. quadrifasciatus, *Fabr.*—Black, shining, head very finely punctured, pubescence very short, base of the clypeus in the ♂, three spots on it in the ♀, scape of the antennæ and a line near each eye above the clypeus, yellow, antennæ ferruginous beneath in the ♀, those of the ♂ much shorter

than in the preceding species; pronotum with a yellow band, mesonotum finely punctured, scutellar impression crenate, scutellum with a yellow band in the ♀; wings with the nervures pale, anterior pair with a smoky spot over the region of the marginal and second sub-marginal cell, posterior wings with the nervure connecting the posterior and median nervures joining the latter beyond its bifurcation, propodeum clathrately rugose, longitudinally costate within the basal area; basal segment of the abdomen rather remotely punctured, the rest very finely, with a yellow band on the first four segments, that of the second not wider than the first; femora black, apices testaceous, front pair flavous beneath in the ♀, tibiæ testaceous, posteriorly black towards the apex in the ♂; only slightly clouded in the ♀, tarsi testaceous, posterior pair brownish at the apex in the ♂.

L. 11–12 mm.

Local, but apparently common where it occurs.

Battersea Fields, July; Birchwood, August; (*Shuckard*). Rugby; (*Morice*). Norfolk; (*Bridgman*). Hastings. Colchester; (*Harwood*). Bristol; (*Dale*).

G. laticinctus, *Lep.*—Very like *quadrifasciatus*, but larger, the antennæ in both sexes rather longer, the clypeus in the ♀ entirely yellow, the sides of the face with a broad yellow spot, and the antennæ beneath pale nearly to the apex; basal area of the propodeum clathrate in both sexes, not longitudinally rugose as in *4-fasciatus*; the second abdominal band much wider than the first, occupying nearly the apical half of the segment; tibiæ in the ♀ black inwardly towards the apex, ♂ with the black colour reaching almost to the base.

L. 12–13 mm.

Rare. I have a ♂ and ♀ from Shuckard's collection, taken in the New Forest, as recorded in his "Fossorial Hymenoptera," and Smith says that this is the only locality known. I have received no notes of its capture recently.

G. bicinctus, *Rossi*.—Coloured nearly as in the pre-

ceding species, but differing considerably in shape and sculpture, surface exceedingly finely rugulose, head and mesonotum dull, distinctly and very closely punctured, basal area of the propodeum finely striated, with a wide central sulcature, sides beyond the area rugosely punctured, wings with a smoky spot across the marginal and second submarginal cells; abdomen shining, very finely and closely punctured, basal segment narrow, constricted at the apex, its sides rounded, a spot on each side near the apex yellow, second segment more than twice as wide as the first, crenate at the base, with a wide curved sub-apical yellow fascia, third segment with a narrow yellow apical band.

L. 11 mm.

Rare. London district; (*Shuckard*). New Forest; (*Curtis*). Woking; (*Morice*). Colchester; (*Harwood*). Bickleigh, near Plymouth; (*Bignell*). Land's End; (*Marquand*).

NYSSON, Latr.

The two spines on the propodeum and the petiolated second submarginal cell at once distinguish the species of this and the following genus from all their allies; the present genus may be distinguished from *Didineis* by the robust form of the species and their dull punctured surface, the short transverse propodeum, and the short pronotum. The genus is widely distributed; Handlirsch says cosmopolitan. I can gather no information as to the habits of the species, except that *N. interruptus* has been bred from decayed wood by Mr. Bignell. Four occur in this country, and Handlirsch in his monograph enumerates sixty-four, of which twenty-three are Palearctic.

- (6) 1. Second segment of the abdomen (viewed sideways) much deeper than the first, and strongly angulated at its base ventrally; abdomen black and yellow.
- (5) 2. Posterior nerve of hind wings uniting with

- the median before the bifurcation of the latter.
- (4) 3. Tubercles of prothorax black, ventral basal angle of second abdominal segment nearly a right angle, its apex scarcely rounded . . . SPINOSUS.
- (3) 4. Tubercles yellow, ventral basal angle of second abdominal segment more obtuse, the apex somewhat rounded . . . INTERRUPTUS.
- (2) 5. Posterior and median nervures of hind wings united by a short perpendicular nervure . . . TRIMACULATUS.
- (1) 6. Second segment of abdomen, viewed sideways, not much deeper than the first, its base rounded, abdomen brown at the base . . . DIMIDIATUS.

N. spinosus, *Fab.*—Black, a band on the pronotum, often absent in the ♂, a band at the apex of the first three abdominal segments, often more or less interrupted especially in the ♀, yellow; tubercles black, wings slightly clouded; legs in the ♂ with the extreme apex of the femora, base and apex of the tibiæ, and the tarsi red; legs in the ♀ red with the femora more or less black at the base; head and mesonotum dull, very rugosely and closely punctured, clothed with brownish hairs, which are longer and denser in the ♂, postscutellum clathrate or longitudinally rugose, propodeum hairy at the sides, largely and sulcately rugose, basal area ill-defined, on each side of the propodeum is a strong angular spine; abdomen somewhat shining, basal segment very largely punctured, closely in the ♂, remotely in the ♀, the remaining segments finely, remotely and superficially so, apical segment in the ♂ bidentate, in the ♀ closely punctured, second ventral segment very largely punctured and sharply angulated at the base, basal segment above, and all the segments beneath clothed with fine grey pubescence; tibiæ hairy.

L. 10–12 mm.

Widely distributed, and common in many localities.

N. interruptus, *Fab.*—Very like *spinosus* but more compact in form and shorter, antennæ shorter, those of the ♂ with the penultimate joint incrassated, and the apical joint as long as the two preceding together, tegulæ

yellow in both sexes; angle at the base of the second ventral segment of the abdomen more obtuse, and slightly more rounded at its apex.

L. 7-9 mm.

Rare. Bishop's Wood, Hampstead; Highgate; (*Smith*). Compton Pathfields, Plymouth; bred from decayed wood; Liskeard, Cornwall; (*Bignell*). Bournemouth; N. Forest; (*Dale*).

N. trimaculatus, *Rossi*.—Shorter and broader than either of the preceding; black, a band on the pronotum, the tubercles, sometimes a line on the scutellum, a spot at each side of the first, second, and third abdominal segments, yellow, knees and apex of tibiæ brown; head and mesonotum largely and rugosely punctured, face clothed with silvery hairs, especially in the ♂, penultimate joint of antennæ in ♂ much larger than the apical and shorter, the latter slightly curved; propodeum with the basal area shining, longitudinally costate, sides beyond the area clothed with silvery hairs, spines short; wings slightly smoky, neuration of hind wings as noted in the table of species; abdomen short, very pointed in the ♀, shining, largely punctured especially towards its base, apical segment bidentate in the ♂, pygidial area in the ♀ very finely and closely punctured, second segment much produced ventrally, and strongly angulated at the base.

L. 7-9 mm.

Rare. Battersea; Southgate; near Colney Hatch; Weybridge; (*Smith*). Shaughbridge, Bickleigh, Devon; (*Bignell*). Rugby; (*Morice*). Norfolk; (*Bridgman*). It is often taken by beating bushes, &c. It feigns death, and falls to the ground when alarmed.

N. dimidiatus, *Jur.* (*guttatus*, *Shuck*).—The smallest species of the genus. Black, tubercles of pronotum pale; base of the abdomen brown, the rest black, second and third segments with a pale spot on each side, tibiæ and tarsi brown; head and mesonotum rugosely punctured,

apical joint of antennæ in the ♂ twice as long as the penultimate, bisinuate beneath; propodeum clathrate above with silvery hairs at the sides, its lateral spines short, the basal area longitudinally rugose; abdomen punctured, more largely towards the base, pygidial area of the ♀ rugosely punctured, apical dorsal valve of the ♂ bidentate; second ventral segment not angularly produced at the base in either sex.

L. 7 mm.

Not rare. Woking; Chobham; Hayling Island; Littlehampton; Hastings. Lulworth; Knighton; Exmouth; (*Dale*). Norfolk; (*Bridgman*). Hampstead; Highgate; Weybridge; Barmouth; (*Smith*). Land's End; (*Marquand*).

DIDINEIS, Wesm.

Somewhat like a red-bodied *Pompilus* in appearance, but allied to *Gorytes* in the dilated pulvilli of the anterior feet, and the structure of the thorax; the apical joint of the antennæ in the ♂ is falciform; the pronotum in both sexes is somewhat elongate and convex, so that a distinct impression separates it from the mesonotum; this latter is considerably wider than the pronotum; propodeum elongate, horizontal, parallel-sided, its apex truncate, the angles of the truncature with a short spine; wings with the second submarginal cell petiolated; abdomen ovate; apical dorsal valve truncate in the ♂, with a distinct pygidial area in the ♀; posterior femora with an apical tooth beneath; tibiae simple, not spinose.

Handlirsch, in his monograph of *Nysson*, &c., enumerates six species, of which four are Palæarctic, and two Nearctic.

The habits of the genus are not known.

D. lunicornis, *Fab.* (*Kennedii*, *Curt.*).—Black, mandibles in both sexes, and the clypeus and base of the antennæ anteriorly in the ♀, the basal segments of the abdomen in both sexes, and the legs more or less, red;

head and thorax dull, very closely punctured, vertex subquadrate in the ♀; wings with a distinct brownish band crossing the marginal, second submarginal, and third discoidal cells in the ♀, indicated by only a slight cloud in the ♂; propodeum with an elongate triangular rugose basal area bounded by a well-defined carina, its sides beyond the enclosure diagonally rugose and clathrate, posterior angles shortly spinose; abdomen shining, distinctly punctured, somewhat hairy, especially towards the apex; posterior femora with a well-defined apical spine beneath.

L. 7-9 mm.

Rare. Worthing; Hastings; Lyme Regis. Bristol; (*Walcott*). Glanvilles Wootton; Lulworth; (*Dale*). Colchester; (*Harwood*). Lowestoft; (*Smith*).

MELLINUS, Fab.

Easily distinguished by a combination of characters which do not exist together in any other genus; species black, shining, with yellow or whitish markings; wings with three submarginal cells, cubital nervure extending almost to the apex of the wing, recurrent nervures received—one at the apex of the first, the other at the base of the third submarginal cell, propodeum short, rounded, with a central basal impression; abdomen petiolated, petiole formed of both dorsal and ventral plates of the basal segment, second segment nearly three times as wide at the apex as the first; eighth ventral segment exposed in the ♂, stipples of armature terminating in two overlapping and membranous plates; apical dorsal valve in the ♀ with a distinct pygidial area; posterior femora terminating in two tooth-like processes; tibiæ spinose along their exterior margin. The species burrow in sand, and provision their nests with *Diptera*. Smith, Cat. Brit. Foss., Hym., 1858, p. 113, describes the method these insects adopt to catch flies. "This," he says, "is managed by running past the

victim slowly, and apparently in an unconcerned manner, until the poor fly is caught unawares and carried off by the *Mellinus* into its burrow." The larva spins a brown silken cocoon; Handlirsch mentions three Palæarctic species, of which we have two in this country.

1. Pale markings yellow, legs yellow and black, surface of abdomen very finely rugulose, but this character is only visible under a very strong lens *ARVENSIS*.
2. Pale markings white, legs reddish and black, surface of abdomen smooth *SABULOSUS*.

M. arvensis, *Linn.*.—Black, clypeus in the ♂, the scape of the antennæ in front, a line on each side of the face, the collar of the pronotum, the tegulæ, a spot under each wing, and the scutellum, in both sexes, yellow. Basal segment of the abdomen with two spots in the ♀ only, second with a wide band in the ♀, with two spots, or entirely black, in the ♂, third segment with a broad band in both sexes, fourth with two lateral spots, sometimes united in the ♀, fifth yellow in the ♀ only, sixth in the ♂ with a central spot; legs yellow, femora at the base, and anterior and intermediate tibiæ posteriorly, black; head and thorax finely and closely punctured, face below the antennæ clothed with pale hairs, antennæ simple in both sexes; wings slightly dusky, basal area of propodeum bounded by a crenate line, its sides raised and smooth, its centre rugose and depressed, beyond the enclosure the propodeum is rugose and hairy, with a raised line on each side; abdomen shining, its surface exceedingly finely rugulose, with shallow scattered punctures on the basal segments, more closely punctured towards the apex, pygidial area in the ♀ striate, largely punctured at the base, apical segments more or less hairy; tibiæ with pale spines.

L. 8–15 mm.

Generally distributed, and often very abundant.

M. sabulosus, *Fabr.*.—Generally smaller than the above, head and thorax less closely punctured and consequently

less dull, antennæ fulvous except at the base above, ♂ with joints eight to twelve produced beneath and subtuberculate, their lower margins dentate at the apex; pale markings white, not yellow, abdomen smooth, shining, surface not rugulose, punctured, second and third segments each with a transverse lateral white spot, those of the second sometimes wanting in the ♂, fifth in the ♀, sixth in the ♂, with a transverse white spot or band; legs fulvous, not yellow as in *arvensis*.

L. 8-13 mm.

Lowestoft; Southwold. Norfolk; (*Bridgman*). Christchurch, Hants; (*Dossetor*). Newcastle; (*Hewitson*). Nottingham; (*Allen*). Milford; (*Marshall*). F. Smith found it in profusion at Lowestoft in August, on Wild Carrot and the males on the leaves of Coltsfoot.

PHILANTHUS, Fab.

Broad, black with yellow markings, strongly punctured, head wider than the thorax, clypeus trilobate, wide in front, its centre produced posteriorly nearly to the insertion of the antennæ, which are much thicker in the ♀ than in the ♂, eyes sinuate on their inner margins; pronotum very short and collar-like, wings with three submarginal cells, the second not petiolated, propodeum rounded, basal area ill-defined; abdomen ovate, segments not strongly constricted at the base and apex, basal segment not much narrower than the second, pygidial area in the ♀ indefinite; anterior tarsi with a distinct pecten in both sexes, tibiæ spinose, intermediate pair with only one calcar. There is only one British species, which provisions its nests with other Aculeate *Hymenoptera*. F. Smith has observed it with *Apis mellifica*, *Andrena fulvicrus*, and *Halictus zonulus*.

P. triangulum, Fab.—Head black, clothed with short hairs, very finely and closely punctured, more coarsely on

the vertex, mandibles pitchy brown, clypeus, sides of the face, a trifid spot in the ♂, and a bifid spot in the ♀ above the clypeus, and a spot behind the vertex yellow; thorax black, hairy like the head, pronotal collar and post-scutellum and sometimes a spot on the scutellum yellow, mesonotum coarsely punctured, propodeum very finely and closely so, basal area very large, limited by an indefinite impressed line; abdomen yellow, deeply and somewhat closely punctured in the ♂, remotely and shallowly in the ♀, apices of the segments slightly impressed, each segment except the apical with a triangular black band at the base, varying much in extent and shape; legs yellow, femora black at the base.

L. 10-15 mm.

Local. I have no notes of recent captures.

Heron Court, Hants; Sandown Bay, Isle of Wight, abundantly; Pegwell Bay; Byfleet; Snaresbrook; July and August; (*F. Smith*).

CERCERIS, Latr.

This genus, which has been monographed by Schletterer in Zool. Jahrbuch II., p. 349-510, is somewhat like the preceding, but may be known from it, and in fact from all the other genera of the *Sphagidæ* by the deep constrictions between the abdominal segments; the head is as wide as or wider than the thorax, the eyes entire, the antennæ filiform, the clypeus in the ♂ has a dense fringe of shining hairs on each side at the apex, and in the ♀ of some species is raised in the centre, face between the antennæ in the ♀ with a sharp carina; wings with three submarginal cells, the second petiolated, propodeum with a well-defined basal area; abdomen subparallel-sided, with the first segment narrow and almost nodiform, the rest constricted at the base and apex, apical segment dorsally with a basal transverse carina extending along the sides to the apex, pygidial area well-

defined in both sexes, and bounded by two nearly parallel carinæ, its surface very largely punctured in the ♂, subrugulose in the ♀; femora produced at the apex externally into a broad blunt process, anterior tarsi pectinated, but the pecten very short in the ♂, tibiæ spinose, posterior pair constricted and bent at the base. A very extensive genus extending over the whole globe, and of which there are several hundred species. Only six occur with us. Their habits are very curious, as their prey varies much, according to the different species, and each seems to keep exclusively to the species of some particular family or order. *C. ornata* almost always provisions its nest with *Halicti*, although sometimes it takes an *Andrena*; *C. arenaria* catches various *Curculionidæ*. F. Smith has taken *C. labiata* conveying specimens of *Haltica tabida* and *C. interrupta* with *Apion rufirostre*. The nests of these insects are formed in the ground and the larva spins a tough brown cocoon.

- | | | | |
|------|----|---|---------------|
| (4) | 1. | Second abdominal segment beneath with a central semi-circular elevation at the base. | |
| (3) | 2. | Basal area of propodeum shining | ORNATA. |
| (2) | 3. | Basal area of propodeum dull and deeply striated | EMARGINATA. |
| (1) | 4. | Second abdominal segment simple beneath. | |
| (6) | 5. | Second abdominal segment almost entirely yellow | QUADRICINCTA. |
| (5) | 6. | Second abdominal segment at the base with a wide triangular black spot reaching to the middle of the segment, or black with two lateral spots. | |
| (10) | 7. | ♂ clypeus tridentate; ♀ with the centre of the clypeus entirely raised and free, or raised only at the apex, which is not deeply and semicircularly emarginate. | |
| (9) | 8. | ♂ penultimate segment of abdomen without a pencil of rigid setæ at the apex laterally, clypeus in the ♀ slightly raised at the apex only | ARENARIA. |
| (8) | 9. | ♂ penultimate segment of abdomen with a pencil of rigid setæ at the apex laterally, centre of the clypeus in the | |

- ♀ much raised and free almost from the base . . . LABIATA.
 (7) 10. ♂ clypeus truncate at the apex; ♀ with the centre of the clypeus convex, raised towards the apex, which is semi-circularly emarginate . . . INTERRUPTA.

C. ornata, *Schæff.*.—Black, dull, very largely and coarsely punctured, face, the scape of the antennæ sometimes, as also a line on the post-scutellum, yellow, wings slightly dusky, especially at the apex; the base of the second abdominal segment and the whole or nearly the whole of the third and fifth in the ♀, and of the third and sixth in the ♂ yellow, fourth in the ♀, fourth and fifth in the ♂ black, occasionally in the ♀, generally in the ♂ with lateral yellow spots, often leaving only a basal triangle black; legs yellow, femora black, except at the apex; head and thorax clothed with pale hairs, ♂ with the clypeus not toothed, ♀ with the apical impression of the clypeus extending towards the base to within a third of its entire length, apical joint of the antennæ in the ♂ simple; basal area of propodeum shining, diagonally striate near the margins, especially towards its basal angles; abdominal constrictions very strongly marked, second segment with a raised basal area beneath, pygidial area in the ♂ shining and very largely punctured, dull and very finely rugulose in the ♀, with only a few superficial punctures, its sides fimbriated, apical ventral segment deeply emarginate in the ♂; tibiæ spinose.

L. 10–15 mm.

Widely distributed and common in many localities.

C. emarginata, *Panz.*, *sabulosa* ♂, *Shuck.*, *Saund.* *Synopsis*, *Smith* ?).—Allied to the preceding in having the second abdominal segment beneath semicircularly raised in the centre, but distinguished easily by the more lemon-yellow colour of the markings, the nearly entirely pale legs, the antennæ fulvous beneath and the deeply striated basal area of the propodeum, on each side of which there is usually

a large yellow spot; in the ♂ the terminal ventral segment is scarcely emarginate, in the ♀ the anterior impression of the clypeus does not extend upwards beyond the centre.

L. 9–10 mm.

The capture of a ♀ of this species is recorded by Smith Ent. Ann. 1861, p. 43, at Kingsdown, near Deal, but he omitted it from his catalogue, published by the Entomological Society, and it therefore escaped my attention, and I have not recorded it either in my Synopsis or catalogue; Dr. Mason was kind enough to forward me the original specimen from Smith's collection, which is undoubtedly referable to this species, and I hope that now attention is called to it other specimens will be found.

C. quadricincta, Panz (*sabulosa*, Smith, *Saund.*, ♀). —Exceedingly like *emarginata* in colour and appearance, but distinguishable at once by the structure of the second ventral plate of the abdomen, which has no raised semi-circle at the base in either sex, the second and fifth segments in the ♀, the second and sixth in the ♂, are nearly entirely yellow, the black band on the second, when present, being at the base of the segment and not at the apex as in *emarginata*, the anterior wings also are darker along the costal margin.

L. 9–11 mm.

Rare. Faversham; Canterbury; (Smith). Colchester; (Harwood).

C. arenaria, Linn. — Black, largely and rugosely punctured, and clothed with scattered brownish hairs, which are more abundant in the ♂, entire face below the antennæ in the ♂, three spots on the clypeus and a triangular spot on each side of the face in the ♀ yellow; clypeus 3-dentate in the ♂, slightly raised and rounded at the apex in the ♀; antennæ with the scape yellow beneath in the ♂, flagellum more or less fulvous beneath in both sexes, apical joint in the ♂ narrowed and curved, vertex behind the eyes with a yellow spot in the ♀;

pronotum with two yellow spots, tegulae and post-scutellum in both sexes, and two spots on the propodeum in the ♀ yellow, wings slightly dusky, clouded along the costa and apex, nervures testaceous, basal area of propodeum dull, striated; abdomen slightly shining, yellow; all the segments in the ♀ except the apical one with a black, more or less angular, basal band; in the ♂ the basal segment is entirely black or has two round lateral yellow spots, carinae of pygidial area in the ♀ subparallel, its surface wrinkled and largely punctured at the base; penultimate segment in the ♂ without lateral pencils of setae, apical ventral valve densely clothed with golden hairs at the base; legs yellow in the ♂, testaceous in the ♀; femora above more or less black, the posterior tibiae black, or clouded at the apex, inwardly.

L. 12-16 mm.

This fine species is abundant in many sandy localities and seems to be widely distributed, but I have received no Irish or Scotch localities for it.

C. interrupta, Panz (*5-fasciata* Smith, Saund., nec Rossi).—Very like the preceding, but smaller and more shining, puncturation of the mesonotum larger and more remote, and the pubescence in the ♂ less dense; clypeus in the ♂ simply truncate at the apex, that of the ♀ raised, the raised portion slightly narrowed and convex towards the apex, which is semicircularly emarginate; basal segment of the abdomen in the ♀ less hairy and with only a small pale spot on each side, pygidial area narrow, wrinkled, largely punctured at the base, that of the ♂ shining and very largely punctured, the penultimate segment in this sex with a pencil of fine hairs on each side, legs testaceous in the ♀, yellow in the ♂, in which sex the anterior and intermediate femora are black at the base, and the posterior pair have a dark subapical ring.

L. 8-11 mm.

Chobham; Southwold; Southend; Birchwood; Lowestoft;

on Wild Parsnip; (*Smith*). Colchester; (*Harwood*). Bournemouth; (*Dale*). Prawle Point; Slapton; (*Big-nell*).

C. labiata, *Fab.*—A trifle larger than *interrupta*, with the puncturation rather larger, closer and less regular; clypeus in the ♂ obsoletely tridentate at the apex, that of the ♀ with its central portion much raised, free nearly from the base, not narrowed towards the front, and only slightly emarginate at the apex; in the ♂ the abdomen beneath is clothed with very long hairs, and the penultimate segment bears a very dense pencil of rigid golden setæ on each side at the apex; this last character distinguishes it at once from small individuals of *arenaria*; all the femora in the ♂ with a large black spot above.;

L. 9-12 mm.

Not rare. Woking and Chobham. Weybridge; Hawley, Hants; Southend; Kingsdown; Sidmouth; (*Smith*). Ramsgate; (*Marshall*). Colchester; (*Harwood*). Sandown; Parley Heath; Dawlish; (*Dale*). Land's End; (*Marquand*). Norfolk; (*Bridgman*).

OXYBELUS, Latr.

The style of the neuration of the wings associates this genus with *Crabro* and its allies, but I am not at all satisfied with its position. Its methods of flight are so like those of *Astatus*, *Tachytes*, &c., as to suggest some relationship with them. I have, however, left it here, not knowing where better to place it. It may be at once distinguished by the neuration of the wings, the anterior pair having only one submarginal cell, which is apparently confluent with the first discoidal, it is, however, really divided from it by a hyaline nervure, which can be seen on close examination, another very indistinct hyaline nervure closes the third discoidal at its apex; besides these alar characters, the wing-like appendages of the scutellum and the

metanotal spine are peculiar to this genus. Kohl, in 1884, Term. Füz. viii., enumerates the then known species, making a total of ninety-two, of which sixty-seven are Palearctic—of these we have four species in Britain. The species provision their nests with *Diptera*.

- | | | | |
|-----|----|--|---------------|
| (6) | 1. | Abdomen not clothed with silvery hairs. | |
| (3) | 2. | Mandibles black. | UNIGLUMIS. |
| (2) | 3. | Mandibles flavous or testaceous. | |
| (5) | 4. | Propodeal spine entire at the apex, more or less pointed | MANDIBULARIS. |
| (4) | 5. | Propodeal spine deeply emarginate at the apex | NIGRIPES. |
| (1) | 6. | Abdomen clothed with bright silvery hairs | MUCRONATUS. |

O. uniglumis, *Linn.*.—Head, including the mandibles, and thorax, black, rugosely punctured, forehead rather densely clothed with erect brownish-grey hairs except on the vertex, face with bright silvery hairs apically, clypeus in the ♂ tridentate, the central tooth being the apex of a strongly-raised central carina; between these teeth the surface is densely clothed with pale hairs; in the ♀ the clypeus has a longitudinal tubercle at the base, and two slightly produced points on its anterior margin, antennæ fulvous beneath; thorax with the tubercles in the ♀ flavous, the tegulæ in both sexes testaceous, scutellum with a central carina, metanotum on each side with a pale, wing-like appendage, propodeum very largely clathrate, with a short, slightly curved basal spine, which is rounded at the apex; abdomen black, clothed with short grey hairs, dull in the ♂, shining in the ♀, in the former generally with a pale lateral spot on the two basal segments only, in the latter with spots on all the segments except the sixth, these are of an ivory white, puncturation exceedingly fine and close, that of the basal segment rather less fine than of the others; legs black, with the tibiæ and tarsi in both sexes, and the apex of the femora in the ♀ fulvous; tibiæ strongly spinose.

L. 6–9 mm.

Common in many sandy places and generally distributed; enjoys the hottest sunshine. Will fly up suddenly and settle again facing the observer, the silvery hairs of its face shining brightly in the sun.

O. mandibularis, *Dahlb.*—Closely allied to *uniglumis*, but distinguished by the pale mandibles, the much stronger and more scattered puncturation of the abdominal segments, and the distinct yellow colour of the spots, which in the ♀ as well as the ♂ are only present on the basal segments; the ♂ has also the antennæ densely clothed with white hairs, so that they look as if they were frosted over; the tubercles and a spot on each side of the pronotal collar flavous; tibiæ flavous, more or less reddish towards the apex, first and second pairs with a posterior streak, third pair with a broad sub-apical band, black.

L. 6–9 mm.

Although very distinct, this may possibly be mixed in some collections with the preceding.

Rare. I have taken ♂ and ♀ at Hayling Island; ♀ at Bournemouth; and I take males on one particular spot on Woking Common, but have not met with a ♀ there. Appledore, Devon; (*Dale*). ♂ and ♀, Saunton, N. Devon; (*Swale*). Norwich; (*Bridgman*).

O. nigripes, *Oliv.*—♀ somewhat like *mandibularis*, but with the head and mesonotum decidedly wider, the entire insect less shining and much more closely punctured, the abdomen especially so, its surface clothed with very short hairs, first and second segments spotted; the propodeal spine emarginate at the apex; the tibiæ of the posterior pairs of legs black, with only the base pale, the tarsi dusky, posterior tibiæ very spinose.

L. 8–9 mm.

I have only seen one example of this, which was taken by Mr. Stevens in Devonshire and described by Smith. This has been kindly lent to me by Dr. P. B. Mason.

O. mucronatus, *Fabr.* (*argentatus*, *Curt.*, *ferox*, *Shuck.*).

—Easily distinguished from either of the preceding by the fine pointed propodeal spine, and the glittering silvery pubescence with which the entire insect is more or less covered; the spots on the abdomen are of a bright yellow, they occur on the first five segments of both sexes, those of the fourth and fifth in the ♀ being united so as to form a transverse band; tibiæ and tarsi, and in the ♀ nearly the whole of the femora, except of the anterior pair, yellowish testaceous.

L. 7–9 mm.

Rare. Sandhills, Hayling Island. Bristol; Liverpool; Deal; (*Smith*). Braunton, Devon; (*Dale*). Cheshire, sandhills; (*B. Cooke*).

CRABRO, Fab.

Differs from all the other genera of the *Sphegidae*, except *Entomognathus*, which may be known by its hairy eyes, in the neurulation of the wings, the anterior pair having each one marginal, one submarginal, and two discoidal cells, the third indicated by very fine hyaline nervures; in the posterior wings the median nerve is bent forward towards the anterior nerve, meeting it about the middle of the front margin; the posterior nerve is quite short, and is united to the median by a transverse nervure. In form and coloration the species vary much, but as a rule the head is large and the vertex sub-quadrate, the clypeus wide, and the mandibles often inserted behind the anterior margin of the eyes; eyes very large, approximate near the base of the clypeus, being separated by the antennal cavities. The position of the ocelli, and the shape of the antennæ, which in the sub-genera *Clytochrysus*, *Solenius*, *Crabro*, and *Thyreus*, are only twelve-jointed in the ♂, are often useful for specific characters. The propodeum has usually a well-defined basal area; the abdomen is oval or elliptic, sometimes potiolated, narrower in the ♂ than in the ♀, ♀ with a distinct pygidial area; the armature of the ♂ is most

peculiar, the cardo is very largely developed, the stipites, as a rule, are very long and pointed, widely foliaceous on their outer margin; the sagittæ short; it varies, however, in form, and in the sub-genus *Lindenius* the stipites lose their foliaceous shape and the sagittæ are long; in some species the seventh dorsal segment is produced at the sides ventrally, so as to project as two points or processes on the ventral surface of the abdomen; legs variable in form, especially the anterior pair, of which the tibiæ and tarsi are often strangely modified. The genus is an extensive one, and seems to exist nearly over the whole world. The species provision their nests with *Diptera* and other insects. The larvæ spin tough brownish cocoons. They form their burrows in various places; some in the ground, others in decaying wood, bramble stems, &c.

- | | | | |
|------|-----|--|--------------|
| (4) | 1. | Abdomen petiolated, basal segment much swollen posteriorly and constricted at the apex (Subg. <i>Rhopalum</i> , Kirb.). | |
| (3) | 2. | Clypeus produced and raised at the apex, face with a short spine between the antennæ | TIBIALIS. |
| (2) | 3. | Clypeus and face simple | CLAVIPES. |
| (1) | 4. | Abdomen not or scarcely petiolated, basal segment not swollen at the apex. | |
| (40) | 5. | Ocelli in an equilateral triangle, abdomen not strongly punctured. | |
| (39) | 6. | Cheeks beneath without an acute spine on their occipital margin. | |
| (32) | 7. | Abdomen black, not banded or spotted with yellow. | |
| (21) | 8. | Seventh dorsal valve of the ♂ not more strongly punctured than the rest; sixth dorsal valve in the ♀ excavated (Subg. <i>Cælocrabro</i> , Thoms.). | |
| (16) | 9. | Basal area of propodeum somewhat indefinite. | |
| (15) | 10. | Tibiæ more or less spinose or dentate on their external margin. | |
| (14) | 11. | ♂ tibiæ simple; ♀ occipital margin of the cheeks beneath not raised nor terminating in a tooth. | |
| (13) | 12. | Legs entirely black, clypeus in the ♂ truncate | LEUCOSTOMUS. |
| (12) | 13. | Legs more or less striped with brown, clypeus in the ♂ pointed | PUBESCENS. |

- (11) 14. ♂ tibiæ scutate; ♀ occipital margin of the cheeks elevated and terminating in a tooth . . . CETRATUS.
- (10) 15. Posterior tibiæ clavate and rounded without spines or teeth . . . CAPITOSUS.
- (9) 16. Basal area of propodeum clearly defined.
- (18) 17. Surface of mesonotum dull, its puncturation so fine as to be only observable through a strong lens . . . PODAGRICUS.
- (17) 18. Surface of mesonotum shining, its puncturation distinct.
- (20) 19. Clypeus black, front tibiæ of ♂ scutate . . . GONAGER.
- (19) 20. Clypeus flavous, front tibiæ simple in both sexes . . . APHIDUM.
- (8) 21. Seventh dorsal valve of the ♂ much more strongly punctured than the rest; sixth in the ♀ not excavated (Subg. *Crossocerus*, Lep.).
- (23) 22. Larger; tibiæ of ♂ scutate, clypeus yellow in both sexes . . . PALMARIUS.
- (22) 23. Smaller; tibiæ simple, clypeus black.
- (29) 24. ♂ with the anterior metatarsi pale, spotted or banded with black, or with a small tooth or tubercle at the sides of the metasternum; ♀ with the metasternum laterally spinose.
- (23) 25. ♂ anterior metatarsi spotted with black; ♀ with the basal area of propodeum diagonally strigose.
- (27) 26. ♂ anterior tarsi with the basal joint scutate; ♀ with the propodeal area smaller, its sulcatures wider and stronger, and with the anterior tarsi slightly wider . . . PALMIPES.
- (26) 27. ♂ anterior metatarsi not scutate; ♀ propodeal area larger, its sulcatures not so strong, anterior tarsi narrower . . . VARIUS.
- (25) 28. ♂ anterior metatarsi entirely pale; ♀ propodeal area smooth, or with such fine striæ as to be observable only under a strong power . . . EXIGUUS.
- (24) 29. ♂ anterior metatarsi not spotted or banded with black; ♀ metasternum not laterally spinose.
- (31) 30. Mesonotum shining, puncturation fine but not very close, tibiæ widely pale at the base; propodeal area polished and shining in both sexes, apex of abdomen testaceous in the ♀ . . . WESMAELI.
- (30) 31. Mesonotum somewhat dull, puncturation very close, propodeal area dull and deeply striate in the ♂, striate

- at the sides only in the ♀, apex of abdomen black. ELONGATULUS.
- (7) 32. Abdomen spotted or banded with yellow.
- 38) 33. Recurrent nervure emitted at a considerable distance from the apex of the submarginal cell, second segment of the abdomen beneath without dull pubescent spots.
- (37) 34. Basal segment of abdomen subpetiolate, longer than its apical width (Subg. *Blepharipus*, Lep.).
- (36) 35. Posterior tibiæ of the ♂ spinose, femora simple; posterior tibiæ of ♀ rather densely spined DIMIDIATUS.
- (35) 36. Posterior tibiæ of ♂ not spinose, femora toothed beneath, near the base; posterior tibiæ of ♀ less spinose than in the preceding SIGNATUS.
- (34) 37. Basal segment of abdomen not subpetiolate, its apical width longer than its entire length VAGABUNDUS.
- (33) 38. Recurrent nervure emitted near the apex of the submarginal cell, second segment of abdomen beneath with two round dull pubescent spots; ♂ antennæ strongly dentate (Subg. *Clytochrysus*, Mor., pars.) CEPHALOTES.
- (6) 39. Occipital margin of the cheeks beneath with a strong spine pointing forwards (Subg. *Hoplocrabro*, Thoms.)
- (5) 40. Ocelli in an isosceles triangle much widest at the base, or with abdomen strongly punctured. QUADRIMACULATUS.
- (56) 41. Abdomen spotted or banded with yellow.
- (55) 42. Abdomen not strongly punctured.
- (48) 43. Mesosternum without a short raised crest in front of the intermediate coxæ; ♂ antennæ fusiform and tibiæ scutate (Subg. *Thyreopus*, Lep.).
- (45) 44. Mesonotum striated CRIBRARIUS.
- (44) 45. Mesonotum not striated.
- (47) 46. Basal segment of abdomen spotted with yellow FELTARIUS.
- (46) 47. Basal segment of abdomen entirely black SCUTELLATUS.
- (43) 48. Mesosternum with a short raised crest in front of the intermediate coxæ.

- | | | | |
|------|-----|--|----------------|
| (50) | 49. | Third abdominal segment entirely black, rarely with a very small yellow spot in the ♀ (Subg. <i>Solenius</i> , Lep.) | VAGUS. |
| (49) | 50. | Third abdominal segment spotted (Subg. <i>Crabro</i> , Dhlb.—gen.). | |
| (54) | 51. | ♂ antennæ simple, pubescence of clypeus in the ♀ silvery. | |
| (53) | 52. | Mesonotum transversely striate in front, the striæ not interrupted in the centre | INTERRUPTUS. |
| (52) | 53. | Mesonotum punctured in the centre anteriorly | LITURATUS. |
| (51) | 54. | ♂ antennæ dentate, pubescence of clypeus in ♀ golden (Subg. <i>Clytochrysus</i> , Mor., pars.) | CHRYSSOSTOMUS. |
| (42) | 55. | Abdomen strongly punctured (Subg. <i>Thyreus</i> , Lep.) | CLYPEATUS. |
| (41) | 56. | Abdomen entirely black or bronzy (Subg. <i>Lindenius</i> , Lep.). | |
| (58) | 57. | Abdomen bronzy-black, head not wider than the mesonotum | ALBILABRIS. |
| (57) | 58. | Abdomen black, not bronzy, head wider than the mesonotum | PANZERI. |

(SUBG. RHOPALUM.)

C. tibialis, *Fabr.*.—Black, head and mesonotum shining, finely and rather remotely punctured, face between the antennæ with a blunt spine; ♂ with the scape of the antennæ, the basal points of the flagellum beneath, the whole of seventh, ninth, and eleventh joints, white, second joint transverse and laterally produced, third and fourth sinuate at the base, and much widened at the apex, ♀ with the antennæ simple, the scape and underside piceous, mandibles yellow at the apex in the ♂, piceous in the ♀; thorax with the tegulæ and tubercles pale, propodeum shining at the base, with a central impressed line, its sides clothed with white pubescence, basal area not defined laterally; abdomen shining, basal segment narrow and very clavate posteriorly, apical dorsal valve in the ♀ carinated at the sides and clothed with erect hairs, its apex testaceous; legs with the apices of the femora, the whole of the front tibiæ and the

bases of the other pairs, and the anterior and intermediate tarsi white, intermediate and posterior tibiæ brown across the middle and red at the apex, posterior tibiæ very clavate, irregularly spinose, posterior tarsi brown, anterior metatarsi in the ♂ very long and dilated, intermediate pair long and angularly produced near the base.

L. 6-7 mm.

Rare; Wandsworth. London District; (*Smith*). Colchester; (*Harwood*). Wotton-under-Edge; (*V. R. Perkins*). Bickleigh and Exminster, Devon; (*Bignell*). Norfolk; (*Bridgman*). Perth. Glanvilles Wootton; (*Dale*). Nunton; (*Marshall*). Boxmoor; (*Piffard*.) *Smith* says it nidificates in brambles and briars.

C. clavipes, *Linn.*—Like *tibialis* in shape but rather smaller and more slender, ♂ with only the scape of the antennæ white, and only the sixth joint sinuate beneath, the tarsi simple and the abdomen with a red central band; the ♀ has the scape of the antennæ white, the abdomen with a red central band, its apical segment not clothed with erect hairs, the intermediate tibiæ entirely pale, posterior pair black at the apex, very clavate and almost destitute of spines.

L. 5-7 mm.

Generally distributed but not recorded from Ireland; nests in dead bramble stems.

(SUBG. CÆLOCRABRO.)

C. leucostomus, *Linn.*—Black, shining, calcaria in both sexes and the extreme base of the posterior tarsi in the ♀ pale; head and thorax clothed with erect hairs, head widely channelled between the eyes, finely and remotely punctured, clypeus clothed with bright silvery hairs, truncate in the ♂, its angles produced and prominent; mesonotum very finely and irregularly punctured, wings slightly smoky, basal area of the propodeum smooth and shining, without any marginal sulcature, central sulcature deep in the ♀, shallow in the ♂, sides beyond the area dull, punctured,

and finely pubescent, abdomen shining, nearly impunctate, regularly ovate in the ♀, sub-elongate in the ♂, apical dorsal valve in the ♀ acuminate and excavated, the extreme apex piceous red; tibiæ of posterior legs irregularly spinose.

L. 6-10 mm.

Common and generally distributed, nests in decayed wood and generally provides its larvæ with a bright green fly—*Chrysomya polita*.

My attention was quite lately called to what must be a large colony of this species in the transverse beam of a garden-gate in a wall; even as late as 5 p.m. in less than two minutes six or eight females flew into apparently the same hole, but I did not see any come out.

C. pubescens, *Shuck.*—♂ like a small *leucostoma*, but with the clypeus produced and pointed in the centre, the face not channelled, although there is a narrow impressed line running from the central ocellus down the face; the head and thorax are rather more hairy, and the central sulcature of the propodeum is crenate, there are also slight indications of lateral crenatures near the base; lateral angles of seventh dorsal segment much produced and exposed ventrally; the anterior and intermediate femora and tibiæ are piceous, the former more or less edged with black, extreme base of posterior tibiæ externally flavous. I have not seen a ♀.

L. 7 mm.

One ♂ Charlwood, Surrey; one ♂ taken in my garden at Woking; one ♂ from Shuckard's Collection; one ♂ Painswick, Gloucester; (*Watkins*).

I know of no other localities. The species is very distinct, and will no doubt some day turn up more freely.

C. cetratus, *Shuck.*—Black, shining, the calcaria and the margins of the dilated anterior tibiæ and metatarsi in the ♂ whitish; head and mesonotum punctured, rugosely so in the ♂, clothed with short, erect hairs; propodeum longitudinally rugose at the extreme base, its sides in the ♂

finely and diagonally rugose, in the ♀ smooth, in both sexes with a narrow impressed central line; abdomen shining, elongate in the ♂, suboval in the ♀, with the apical segment acuminate and excavated, clothed at the sides with erect hairs, extreme apex piceous; front tibiæ in the ♂ dilated and widely rounded on their outer margin, which is pale, somewhat membranous and ciliated, front metatarsi also dilated and pale outwardly, intermediate metatarsi pale, posterior tibiæ in both sexes with irregular spines.

L. 7-8 mm.

The ♀ closely resembles that of *leucostomus*, but the abdomen is shorter and more ovate, and the central impression of the propodeum is narrower and less distinctly excavated.

Rare; London district; Weybridge; Bristol; Lancr-cot, Northumberland; (*Smith*). Shiere; (*Capron*). Glanvilles Wooton; (*Dale*). Tavistock; (*Swale*). Gloucestershire; (*V. R. Perkins*). Bishops Teignton; Cornworthy; Bridgenorth; (*Marshall*).

C. capitosus, *Shuck*.—Black, shining, head and thorax very finely and remotely punctured, clypeus produced in the centre; propodeum with a crenate line across the base, otherwise smooth and rounded, slightly wrinkled posteriorly at the sides, with a fine central channel; abdomen shining, almost impunctate, widest behind the middle, apical segment shining in both sexes, in the ♀ slightly impressed, its sides raised and carinated, and fringed with long hairs; anterior tibiæ in front, the anterior and intermediate tarsi and the extreme base of the posterior tibiæ whitish, posterior tibiæ very clavate, without spines.

L. 8 mm.

Rare, but generally distributed. G. A. J. Rothney has bred it from bramble stems.

C. podagricus, *V. d. Lind*.—Black, head and thorax rather dull, the puncturation so fine as to be only observable under a strong lens, scape of the antennæ in front yellow;

mesonotum anteriorly with four longitudinal impressed lines, the central pair very close together, longer and deeper than the lateral pair, wings with a slight cloud across the marginal cell, basal area of the propodeum sharply defined, surrounded by a wide crenate impression, its surface punctured, finely sulcate down the middle, the sulcature continued beyond the crenate impression; abdomen shining, apical dorsal valve in the ♂ scarcely punctured, in the ♀ acuminate, carinated at the sides, with a trilobate apical fovea; anterior femora in the ♂ fringed with long hairs beneath, yellow in front, anterior tibiæ and tarsi, except a black spot on the tibiæ beneath, yellow in both sexes, intermediate femora in the ♂ with a central yellow stripe, posterior tibiæ narrowly yellow at the base, very clavate, irregularly dentate.

L. 6 mm.

Common in many localities, Chobham; Hastings; Bromley; Barnstaple. Wotton-under-Edge; (*Perkins*). Colchester; (*Harwood*). Rugby; (*Morice*). Sidmouth; (*Smith*). Hazelgrove (*B. Cooke*). F. Smith says this species provisions its cells with a small gnat.

C. aphidum, *Lep.* (*Walker*, *Shuck.*).—Black, shining, head and mesonotum punctured, mandibles, clypeus, a line along the inner side of each eye above the clypeus, and the scape of the antennæ in front yellow; thorax with a spot on each side of the pronotum, tubercles, tegulæ, and a spot on the scutellum and postscutellum, often wanting, especially in the ♂, yellow, basal area of the propodeum shining, enclosed and divided centrally by crenate impressions; abdomen subelliptic, finely punctured; anterior and intermediate legs in the ♂, except the base of the femora above, the base of the posterior tibiæ widely, and the metatarsi, yellow; the ♀ has the legs coloured as in the ♂ but the anterior knees only are yellow, and there is a black spot on the anterior and intermediate tibiæ; posterior tibiæ in the ♂ simple, not very clavate.

L. 7 mm.

Very rare. I possess the type of Shuckard's *Walkeri*, to which he assigns no locality; the only other records I have for it are Cromer; (*Smith*). Herne, Hants; (*Dale*).

C. gonager, *Lep. (ambiguus, Dahlb.)*.—Black, shining, head and mesonotum finely and somewhat remotely punctured, ♀ with the mandibles at the base, and the scape of the antennæ beneath pale, clypeus in the ♀ with two small teeth on its apical margin, cheeks beneath, in both sexes, with the occipital margin raised and somewhat toothed in front, face deeply channelled between the eyes, with a small tooth between the antennæ in the ♀; basal area of the propodeum shining, surrounded and divided down the middle by crenate sulcatures; abdomen exceedingly finely punctured and clothed with very short hairs, only noticeable under a high power, apical dorsal valve in the ♀ channelled, shining and largely punctured; anterior tibiæ in the ♂ dilated, pale in front and at the apex, metatarsi scutate, white, with three black spots, the second, third, and fourth joints of the tarsi also dilated and pale, the second and third black towards the apex anteriorly, anterior tibiæ in the ♀ pale in front only, posterior tibiæ in both sexes pale at the base, spinose.

L. 6–7 mm.

Rare. Wotton-under-Edge; (*F. R. and R. C. L. Perkins*). Worcester; (*J. E. Fletcher*). Near Allington Locks, Maidstone; (*W. H. Bennett*).

(SUBG. CROSSOCERUS.)

C. palmarius, *Schreb. (scutatus, Fab., &c.)*.—Black, shining; head finely punctured, clypeus, scape of the antennæ in front, and in the ♂ the cheeks just above the mandibles and beneath flavous, clypeus and face below the antennæ clothed with brilliant silvery hairs in both sexes; thorax less finely punctured than the head, pronotum with a transverse

line in both sexes, prosternum entirely and tubercles in the ♂, post-scutellum in both sexes and scutellum in the ♂, flavous, mesonotum with a double dorsal line anteriorly, mesopleuræ silvery, with a slight spine posteriorly, basal area of the propodeum shining, very finely striate, surrounded and divided down the middle by crenate sulcatures; abdomen shining, very finely punctured, apical dorsal valve very largely punctured in both sexes, not excavated in the ♀; anterior legs yellow, femora swollen in the ♂, with a black line posteriorly, simple in the ♀ and black except at the apex, tibiæ very largely scutate in the ♂, membranous posteriorly with an irregular black apical spot, produced in a curved dark line on the disk of the tibia, metatarsi scutate, black externally, remaining joints very short, tibiæ and tarsi in the ♀ simple, the former black posteriorly, intermediate legs yellow, femora with a black spot in front and behind in the ♂, black except at the apex in the ♀; tibiæ black posteriorly in both sexes, posterior legs with the tibiæ yellow at the base with pale spines on their outer margin.

L. 7-8 mm.

Local. Woking; Wimbledon, Birch and Darent Woods; Southend; Devonshire; (*Smith*). Glanvilles Wootton; Herne; Knighton Heath; Dorchester; (*Dale*). Norfolk; (*Bridgman*).

C. palmipes, *Linn. (tarsatus, Shuck.)*.—Smaller than *palmarius*, black, shining; head finely punctured, with a narrowly impressed dorsal line, scape of the antennæ yellow in front; collar of the pronotum with the yellow spot on each side sometimes wanting, mesonotum more strongly punctured than the head, with a raised dorsal line in front, and a shorter carina on each side, scutellum in the ♂ with a yellow spot, mesopleuræ posteriorly with a small spine beneath, propodeum with its basal area diagonally strigose, surrounded and divided down the centre by crenate sulcatures; abdomen microscopically rugulose and finely punctured, apical dorsal valve in both ♂ and ♀ black at the apex, dull,

strongly and somewhat closely punctured; ♂ with the anterior legs yellow, except a black line posteriorly, calcaria black, metatarsi dilated, with a black central band, second and third joints of the tarsi slightly dilated, with their lateral angles black, fourth and fifth black, anterior legs in the ♀ black, the tibiæ in front, and the basal joints of their simple tarsi yellowish white, calcaria white, or dusky, intermediate and posterior legs black, the base of the tibiæ and tarsi, and in the ♂ the front of the intermediate tibiæ, pale yellowish; tibiæ distinctly spinose.

L. 7-8 mm.

Local, but abundant and widely distributed in the South; not recorded from Scotland and Ireland.

C. varius, *Lep. (spinipectus, Shuck.)*.—The ♂ of this species may be at once known from that of the preceding by the simple, not scutate, anterior metatarsi, which have a central transverse black band, and by the pale anterior calcaria; the ♀, however, is so closely allied to *palmipes* that there is, so far as I know, no very certain character whereby to distinguish it; the front tarsi are, however, rather narrow, and the metatarsus has its sides parallel, whereas in *palmipes* its outer margin is slightly curved at the base, the scutellum has nearly always a central yellow spot, the spines of the mesopleuræ are less developed, and the crenatures of the propodeum deeper.

L. 7-8 mm.

Apparently more widely distributed than the preceding, but I have rarely met with it myself.

C. anxius, *Wesm. (exiguus, Shuck.)*.—Easily distinguished from either of the preceding, which have the mesopleuræ spinose, by the entirely pale anterior metatarsi and the pale tubercles of the ♂, and the shining smooth basal area of the propodeum in both sexes, which is surrounded by much deeper and more clearly defined crenate sulcatures, especially along the base; the extreme apex of the abdomen is red in both sexes; the intermediate tibiæ

also in the ♀ are uninterruptedly white in front. In these latter characters this species resembles *Wesmaeli*, but the spinose mesopleuræ and the finer puncturation of the somewhat dull apical dorsal valve in both sexes will distinguish it easily; this species is also peculiar in having the abdomen of a more regularly elliptic form than its allies.

L. 5–6 mm.

Rare; Chobham; Tunbridge Wells. Battersea Fields; (*Shuckard*); Earham, Norfolk; (*Bridgman*). Exeter; (*Parfitt*). Gloucestershire; (*Perkins*).

C. *Wesmaeli*, V. d. Lind.—Black, shining; head and thorax closely and rather finely punctured, scape of the antennæ yellow in front, pronotal collar in the ♀ generally with two spots, or a transverse band yellow, tubercles yellow in both sexes, scutellum generally yellow in the ♀, mesopleuræ not spinose, propodeum with the basal area shining and smooth, surrounded and divided down the centre by deeply crenate sulcatures, and bounded laterally below the area by crenate impressions; abdomen with the apical dorsal valve very shining and smooth in both sexes, its punctures exceedingly large and scattered, its apex red; femora yellow at the extreme apex in both sexes, and also underneath in the ♂, anterior and intermediate tibiæ yellow, except a black line behind, posterior tibiæ widely yellow at the base, tarsi pale at the base.

L. 5–6 mm.

Common in sandy localities and generally distributed.

C. *elongatulus*, V. d. Lind. (*propinquus*, *Shuck.*; *hyalinus*, *Shuck.*; *obliquus*, *Shuck.*; *pallidipalpis*, *Shuck.*; *transversalis*, *Shuck.*; *luteipalpis*, *Shuck.*; *proximus*, *Shuck.*; *scutellaris*, *Smith*).—Duller and less brightly coloured than the preceding the ♂ may easily be known by the dull, deeply strigose basal area of the propodeum and by the form of the intermediate tibiæ, which are very thin at the extreme base and then rather suddenly thickened; man-

dibles, palpi, anterior femora and tibiæ in front yellow, legs otherwise black.

♀ with the legs much darker than in *Wesmaeli*, the tibiæ of the intermediate and posterior pairs pale only at the extreme base; the puncturation of the mesonotum is closer and finer and its surface duller, and the propodeal area is finely diagonally striate near the lateral margins.

L. 5-6 mm.

Common and generally distributed.

(SUBG. HOPLOCABRO.)

C. quadri-maculatus, *Dhlb. (geniculatus, Shuck.)*.—This species may be known at once by its cheeks beneath having their occipital margin raised and produced into a sharp spine anteriorly; head and thorax black, the mandibles piceous, clypeus in the male with six teeth, antennæ in the ♂ with the apical joint truncate and somewhat wedge-shaped, the flagellum pilose beneath, simple in the ♀, pronotum often with two yellow spots, and the post-scutellum sometimes, more or less yellow, mesonotum punctured, shining in the ♂, propodeum with its basal area shining, surrounded and divided centrally by crenatures; abdomen varying in colour from entirely black, to black, with two lateral yellow spots or transverse bands on the first to the fourth segments, the fifth entirely yellow; every variation between these extremes occurs; the ♂ has rarely more than the second and third segments spotted, and the black varieties are generally of this sex; I have only once seen a black ♀; apical dorsal valve in the ♀ flat, with a few large punctures; femora black, anterior and intermediate pair in the ♂ yellow in front, tibiæ yellow, black posteriorly, posterior pair also black in front, leaving only the base pale, spinose in the ♀.

L. 8-10 mm.

Common; burrows in rotten wood, &c.

Smith says it provisions its nest with small *Diptera*.

(SUBG. BLEPHARIPUS.)

C. dimidiatus, *Fab.*—Head black, punctured, mandibles pitchy in the ♂, yellowish in the ♀, cheeks produced into a blunt tooth at the base of the mandible in the ♂, scape of the antennæ in the ♀ entirely yellow or nearly so, flagellum pilose beneath in the ♂, vertex very shining, deeply impressed longitudinally on each side between the eyes; pronotum with a transverse yellow spot on each side, mesonotum somewhat shining and shallowly punctured in the ♂, dull, finely and closely punctured in the ♀, clothed with scattered hairs, the scutellum sometimes yellow, post-scutellum generally yellow, propodeum with its basal area shining, crenate at the base, surrounded by an impressed line, and widely sulcate down the centre, sides beyond the area hairy; abdomen black, shining, subpetiolated, with yellow lateral spots on the segments, sometimes connected into transverse bands, the basal segment in the ♀ sometimes entirely yellow, and the second fourth and following segments often entirely black in the ♂, basal segment about once and a half as long as its apical width, sixth dorsal segment in the ♂ produced at its posterior ventral angle into a blunt black spine, these spines appear as ventral tubercles at the base of the seventh ventral segment, apical dorsal valve in the ♀ largely punctured; legs with the femora black, more or less yellow beneath, especially in the ♂, tibiæ and tarsi yellow in the ♀, the former in the ♂ black posteriorly, and the hind pair almost entirely black, tarsi pitchy, tibiæ spinose in both sexes.

L. 12 mm.

A very variable species in colour. Common in the North and West, but rarer in the South and East; Maidstone and Hastings; (*Frisby*). Yorkshire; (*Smith*). Gloucestershire, breeding in posts and stumps, and preying on large blue-bottle flies; (*V. R. Perkins*). Devonshire, common; and received from several localities in Scotland.

C. signatus, *Panz.*—Very like the preceding, but the ♂ distinguishable at once by the smaller head, the sharp genal spine at the base of the mandibles, the yellow scape of the antennæ, the entirely yellow tibiæ and tarsi, the former of which are dilated, smooth, and rounded without spines, and by the small sharp tooth near the base of the posterior femora on their inner margins.

♀ very like *dimidiatus*, but the vertex has two narrow carinæ extending obliquely across the impressions, originating near the anterior margin, and directed inwards towards the posterior ocelli; the abdomen has the basal segment rather shorter in proportion to its apical width, the apical dorsal valve less strongly and more remotely punctured; the sixth dorsal segment has ventral spines in the ♂, as in *dimidiatus*; tibiæ entirely yellow, posterior pair more rounded externally, and less spinose.

L. 12 mm.

Very rare. Cline Wood, near Swansea, ♂; (*Dossetor*). Glanvilles Wootton; (*Dale*). Colchester, ♂ and ♀; (*Harwood*). Eaton, Norfolk, out of old palings, ♂; (*Bridgman*). I have taken a few ♀, which I believe belong to this species, near Chobham.

C. vagabundus, *Panz.*—Head and thorax black, hairy, rugosely punctured, somewhat superficially in the ♂, scape of the antennæ, except a black line posteriorly, a line across the collar, or two transverse spots, and in the ♀ a spot on the scutellum, yellow, head impressed in the region of the ocelli, antennæ simple, cheeks not spinose; basal area of propodeum smooth and shining, surrounded and divided down the centre by crenate sulcatures, beyond the basal area somewhat rugose and hairy; abdomen shining, black, basal segment scarcely longer than its apical width, not petiolated, with a narrow transverse yellow band, generally absent in the ♂, second and third segments in both sexes with wide lateral yellow spots almost united on the disk, fourth with a continuous band or two spots in the ♀, with

two small spots in the ♂, fifth entirely pale in the ♀, sometimes with a central spot in the ♂, sixth sometimes with a transverse spot in the ♂, piceous in the ♀, subacuminate, shining, with short pale hairs at the sides, channelled at the apex, second segment beneath without lateral pilose spots; legs with the femora black, fringed with hairs beneath, anterior and intermediate pairs in the ♂, yellow beneath, the anterior pair toothed on the underside, tibiae and tarsi yellow, intermediate and posterior pairs sometimes with a black mark near the apex.

L. 9–13 mm.

Not uncommon, and widely distributed. The ♂ might be confounded with that of *quadri maculatus*, but wants the spines on the occipital margin of the cheeks; the ♀ resembles that of *chrysostomus* in colour, but has the ocelli arranged in an equilateral triangle, and the second ventral segment without pilose spots.

(SUBG. CLYTOCHRYsus.)

C. cephalotes, Pz. (*sexcinctus*, Smith; *interstinctus*, Smith).—Larger than *vagabundus*, head and thorax black, dull, clothed with grey hairs, closely and rugosely punctured; mandibles yellow in the ♀, face deeply channelled, clypeus and sides of the face between the eyes clothed with brilliant golden hairs in the ♀, with golden or silvery in the ♂, antennae with the scape yellow in both sexes, twelve-jointed in the ♂, pale beneath, scape with a black line above, third joint very long, produced posteriorly near the base and at the apex into a blunt tooth, fourth and fifth joints of normal length, with an apical tooth only, flagellum in the ♀ simple; pronotum with two lateral spots, occasionally absent in the male, mesonotum in the ♀ strigose among the punctures, in the ♂ the striae are only visible posteriorly, scutellum in the ♀ sometimes with a yellow spot, propodeum dull, longitudinally strigose at the base, transversely posteriorly

basal area indefinite; abdomen black, shining, with large yellow lateral spots or continuous bands on all the segments, basal segment hairy above, apical dorsal valve in the ♀ very narrowly acuminate and sulcate, densely clothed at the sides with long bristly yellow hairs, apical ventral valve largely punctured towards the apex, stipites of ♂ genital armature fringed externally with very long hairs, second ventral segment with a dull round spot on each side in both sexes; legs yellow, the femora entirely black except at the apex in the ♀, more or less black, especially posteriorly in the ♂, tibiæ in the ♂ sometimes black posteriorly, densely spinose in the ♀.

L. 12-15 mm.

Common, and generally distributed.

The arrangement of the ocelli distinguish this species from *chrysostomus*, and the dentate antennæ of the ♂ and the form of the apical dorsal valve of the ♀ from *vagabundus*.

C. chrysostomus, *Lep.*—Very like a small *cephalotes*, but distinguishable in both sexes by the ocelli, which in this species are arranged in a triangle whose base is much longer than its sides; the antennæ in the ♂ are twelve-jointed, and formed much as in *cephalotes*, only the fourth and fifth joints are scarcely produced at the apex, the channel between the antennæ is wider and less deep in both sexes, the basal area of the propodeum is strongly and diagonally strigose, and defined posteriorly by a distinct carina, behind which the striæ are transverse, it is divided down the centre by a crenate sulcature; abdomen marked much as in *cephalotes*, only the yellow spots are less extensive, especially in the ♂, in which sex the centre of the abdomen above is widely black; tibiæ in the ♀ black beneath, and less spinose than in *cephalotes*, posterior tarsi and intermediate tibiæ in the ♂ often entirely black.

L. 10-12 mm.

Not rare; makes its nests in decaying wood.

(SUBG. SOLENIUS.)

C. vagus, *Linn.*.—Black, head and thorax dull, hairy, closely punctured, scape of the antennæ, except the base posteriorly, yellow; antennæ in the ♂ twelve-jointed, the fifth joint slightly and sixth deeply, sinuated beneath, posterior ocelli very distant; pronotum with a yellow spot on each side of the collar, mesopleuræ transversely rugose, wings rather dusky, propodeum with the basal area indefinite, diagonally strigose or rugose, with a central crenate furrow; abdomen shining, finely punctured, ovate in both sexes, black, basal segment clothed with long hairs, second, fifth, and sixth with a yellow spot on each side, often united in the ♂, third immaculate in the ♀, rarely with a small lateral spot in the ♂, sixth in the ♂ yellow at the base, apical dorsal valve of the ♀ narrowly acuminate, sides clothed with long golden bristly hairs; legs with the femora black, their apices and the front of the anterior pair usually yellow, tibiæ yellow, narrowly black at the apex, and often black on the posterior side, tarsi dusky, pale at the base in the ♂, posterior and intermediate tibiæ dentate and spinose in the ♀.

L. 10–13 mm.

Common; the entirely black third segment of the abdomen gives this species a character by which it is easily recognized.

(SUBG. THYREOPUS.)

C. cribrarius, *Linn.*.—Head and thorax black, and rather densely hairy, the former finely punctured, and strigose between the eyes, face widely impressed, antennæ in the ♂ fusiform, simple in the ♀, with a yellow spot near the apex of the scape, ocelli in an isosceles triangle; pronotum with two yellow spots in the ♀, its angles subspinose in the ♂, mesonotum rugosely punctured and longitudinally striate in both sexes, scutellum yellow in the

♀, propodeum diagonally rugose, with a crenate central sulcature, very hairy in the ♂; abdomen shining, elongate in the ♂, rather wider in the ♀, black, a continuous band on the first, a large yellow lateral spot on the second and third, and a continuous band on the others yellow, ♀ with the apical dorsal valve flat, strongly punctured and aureo-pubescent; femora black, anterior pair in the ♂ short and swollen, produced behind into a large, irregular, somewhat twisted, five-sided process, between which and the base is a sharp spine, anterior tibiæ thickened, produced externally into a large membranous patella, concave beneath, testaceous above, irrorated with small white spots, tarsi black, much dilated, inner claw very long, bisinuate and apiculate, intermediate and posterior tibiæ and tarsi testaceous, the tibiæ spinose in both sexes.

L. 13–15 mm.

Common in most sandy localities, and widely distributed; makes its burrows in the ground.

C. peltarius, Schreb. (*patellatus*, Panz.).—Like the preceding, but smaller and rather more elongate, easily distinguished by the simply punctured, not strigose, mesonotum, which is clothed with very short erect hairs; the rugosities of the propodeum also are much stronger and shining; in the ♂ the anterior femora are produced posteriorly into a flat, yellow, shining process, bearing at its base an almost hairlike spine, coxæ spined posteriorly, patellæ of the tibiæ striped with white posteriorly, tarsi with the inner claw dilated and flattened into a thin plate at the base, produced into a narrow twisted spine at the apex; in the ♀ the pronotal angles are slightly produced.

L. 11–13 mm.

Common, and generally distributed.

C. scutellatus, Chev. (*pterotus*, Fab.).—Rather smaller than *peltarius* and less elongate, with the head and thorax duller and more closely punctured in both sexes, and the first segment of the abdomen entirely black; the ♂ may be

further known by the shape of the anterior femora; these are triangularly dilated externally, and armed with a sharp curved spine near the centre of their inner margin, the tibiæ are testaceous, and the patellæ greyish-brown, radiately striate with whitish-yellow at the base, inner claw of the tarsi produced into a wing-like appendage.

L. 10–11 mm.

Chobham; Woking. Rare; burrows in bare sandy patches on the commons.

C. interruptus, *De G. (Lindeniuss, Shuck.)*.—Head and thorax black, shortly hairy, the former closely and finely punctured, clypeus clothed with silvery hairs, antennæ simple in the ♂, 12-jointed, scape yellow, black behind in the ♂, posterior ocelli very distant, mandibles in the ♀ yellow; pronotal collar with two spots and the tubercles yellow, mesonotum transversely striate in front, longitudinally striate posteriorly and at the sides, scutellum with a yellow spot in the ♀, wings slightly smoky, propodeum longitudinally rugose near the base, transversely near the apex, with a central crenate sulcature; abdomen black, all the segments with lateral yellow spots, often united into transverse yellow bands, fifth segment in the ♀, and fifth, sixth, and seventh in the ♂ almost entirely yellow, basal segment hairy, apical dorsal valve in the ♀ narrowly acuminate, largely punctured, clothed with bristly golden hairs at the sides, in the ♂ with a deep central impression; legs with the femora black, yellow at the apex, and anteriorly in the front legs of the ♂, tibiæ yellow, anterior and intermediate pairs with a black streak behind, tarsi yellow, dusky at the apex, intermediate metatarsi in the ♂ produced on their anterior side.

L. 12–15 mm.

Rare. Mr. Bignell has bred it from decaying wood. Darenth; Southgate; Ripley; Bristol; (*Smith*). Oxford; (*R. C. L. Perkins*). Gloucestershire; (*V. R. Perkins*). Devonport; (*Bignell*). St. Mary Clist; (*Parfitt*). York-

shire; (*Inchbald*). Norfolk; (*Bridgman*). Cheshire Coast; (*B. Cooke*). Cambridge; (*Sharp*). Rugby; (*Morice*).

C. lituratus, *Panz.* (*Kollar*, *Dahlb.*; *vestitus*, *Smith*).—Very like the preceding, but rather smaller; both sexes may be known by the rather dark smoky-grey wings, which in *interruptus* are of a yellow tint, and also by the sculpture of the mesonotum, the transverse striæ near the anterior margin being interrupted by two longitudinal carinæ, leaving a small simply-punctured area between them; the scutellum and propodeum also are much smoother, and the mesopleuræ somewhat shining, and only superficially striated; the ♂ has the intermediate metatarsi simple, and the apical dorsal valve without a central impression.

L. 10 mm.

Rare; has been taken by Mr. Billups near Headley, Surrey, and by Mr. Harwood at Colchester, and in Yorkshire by Mr. F. Smith, but I know of no other localities.

I am glad to be able to settle the position of *vestitus*, *Smith*. When I wrote my Synopsis in 1880, I failed to find the type in *Smith's* collection; it has, however, since been discovered, and Dr. Mason has sent me the type specimen, which undoubtedly is an individual of this species.

C. clypeatus, *Linn.* (*vevillatus*, *V. de Lind.*, &c.).—Head and thorax black, coarsely punctured, the former in the ♂ very small, triangular, the sides behind the eyes converging rapidly in straight lines to the neck, in the ♀ the head is large and quadrate; scape of the antennæ yellow in front, pronotum in the ♂ subelongate, very narrow in front, widening towards the mesonotum, of ordinary form in the ♀, the anterior angles subspinose, tubercles yellow in both sexes, mesopleuræ largely and rugosely punctured; abdomen very largely punctured, the first four segments with large lateral yellow spots, and the rest with continuous bands, apical dorsal valve in the ♀ very narrowly acuminate and sulcate, its sides clothed with bristly golden hairs; legs yellow, the

posterior femora in the ♂ and the base of all the femora in the ♀, more or less black, intermediate pair in the ♂ and their trochanters spined beneath, anterior tarsi dilated in the ♂, the metatarsus produced laterally into a large patella, concave beneath.

L. 9-10 mm.

This extraordinary species has only been captured twice in this country, and both times at Weybridge, by Mr. F. Smith, a ♂ occurring in 1848 and a ♀ in 1853, since which there is no record of its capture.

(SUBG. LINDENIUS.)

C. albilabris, *Fab.*—Black with a slightly bronzy tint, especially in the ♂; head and thorax punctured, ♂ with the scape of the antennæ yellow at the apex, posterior ocelli very remote from each other; pronotal collar in the ♂ with an interrupted yellow line, entirely black in the ♀, tubercles yellow in the ♂, piceous in the ♀, mesothorax as wide as the head, tegulæ testaceous, propodeum with the basal area longitudinally striated, surrounded by a crenate sulcature, but without any central channel; abdomen finely punctured, covered with short decumbent grey hairs, apical dorsal valve in the ♀ flat, largely and closely punctured and clothed with very short golden hairs, its apex testaceous; legs with the femora black, their apices flavous in the ♂, tibiæ and tarsi flavous in the ♂, black in the ♀, with the anterior tibiæ in front and the others at the base yellow, and spinose on their outer side.

L. 7-8 mm.

Common on *Umbelliferæ*, &c., and generally distributed.

C. Panzeri, *V. de Lind.*—Very like the preceding, but black without any brassy tinge; both sexes may be known by the large head, which is wider than the thorax; the ♂ may be further recognized by the strong spine on the

underside of the cheeks, the yellow mandibles, the entirely black pronotum and the black apices of the tibiæ; the ♀ by the yellow mandibles, the clear yellow scape, the yellow tibiæ and tarsi, the usually yellow-spotted pronotum and tubercles, and occasionally yellow-spotted scutellum.

L. 7-8 mm.

Rare. Chobham; Darenth; Birchwood; Weybridge; Isle of Wight; Cromer; (*Smith*).

The yellow colour in this species predominates in the ♀, in the preceding in the ♂.

ENTOMOGNATHUS, Dahlb.

Very like one of the *Lindenius* group of the preceding genus, but easily distinguished by the hairy eyes and the deep sinuation at the base of the mandibles. There is only one British species.

E. brevis, *V. de Lind.*.—Black; head and thorax shining, remotely and rather largely punctured, clothed with short erect hairs, mandibles dentate externally at the base, the dilated portion flavous in the ♂, scape of the antennæ flavous in front in both sexes, eyes clothed with fine white hairs; pronotum with the tubercles yellow, basal area of the propodeum shining, surrounded and divided down the centre by crenate impressions, sides finely pilose; abdomen finely punctured, posterior margins of the segments narrowly piceous, apical segment piceous, dorsal valve in the ♀ largely punctured; anterior and intermediate legs in the ♂ flavous, except a black line beneath the femora, and also a black line along the top of the intermediate pair, posterior femora black with the apex yellow, tibiæ and tarsi flavous; ♀ with the femora black, the anterior pairs yellow at the apex, the tibiæ yellow, the posterior pair dark towards the apex, posterior and intermediate tibiæ denticulate and spinose.

L. 5-6 mm.

Common and generally distributed.

DIPLOPTERA.

Two only of the families of wasps are represented in this country, the *Vespidæ* and the *Eumenidæ*; the former is composed of social species, the latter of solitary. The social wasps, which include the hornet, are so well known that no one will have any difficulty in recognizing them; they make their nests of a papery substance formed out of the masticated fibre of wood, or sometimes of actual paper, as coloured stripes occasioned by the use of this material have frequently been observed in the substance of their nests. The ♀ passes the winter in an impregnated state, and sets to work in the spring to found a new colony; according to Smith, she commences by making a footstalk sufficient to support the first two or three layers of cells, and at the end of it she commences three cells, makes an umbrella-like cover over them and begins to lay her eggs, after which she adds more cells; as the workers hatch out they help to make the nest. The cells are arranged in layers, and a large nest, according to Smith, may contain as many as 2500 to 2600 individuals. Packard says that the females feed their larvæ "with food chewed up and reduced to a pulp," and Westwood that "the egg state lasts eight days, the larva state thirteen or fourteen, and that of the pupa about ten. After the imago has been produced, one of the old workers cleans out the cell, and fits it for the reception of a fresh inhabitant. The upper tier of cells, being first built, serves for the habitation of the workers; the females, being produced at the end of the summer, occupy the lowest tier." Some species of wasps always build above ground, either in a bush or in the branches of a tree; some almost always in the ground, but occasionally in an outhouse or verandah; while the hornet, as a rule, chooses a hollow tree, although it has been known to build in a bank. The habits of *V. austriaca* (*arborca* Sm.) are not yet fully understood, only males and females are known,

and Schmiedeknecht has suggested the possibility of its being an inquiline species living with other wasps, as *Psithyrus* does with *Bombus*, but at present I think there is no direct evidence to prove this, although the theory is ingenious and very far from improbable.

The Solitary Wasps, all of which, in this country, are narrow black insects ornamented with yellow bands, are variable in their choice of nest localities. *Eumenes* makes a mud-covered nest, and attaches it to a twig of heath or some other plant. Some species of *Odynerus* nest in the ground, and some in holes in walls, keyholes, or other suitable cavities; but all, so far as the British species are concerned, construct their cells of mud and provision them with caterpillars. All the species sting with great severity.

The *Diploptera* may be known scientifically by having their wings longitudinally folded when at rest, the pronotum produced backwards to the tegulæ on each side, the lateral prolongations covering the sides of the mesonotum; the eyes are deeply sinuate. The two families may be distinguished thus:—

1. Species social, mandibles not sulcate, claws simple. VESPIDÆ.
2. Species solitary, mandibles elongate, longitudinally sulcate, claws toothed near the apex. EUMENIDÆ.

VESPIDÆ.

Species social, communities consisting of males, females, and workers; hairs simple or sometimes twisted, eyes deeply sinuate on the inner margin, antennæ simple in both sexes, mandibles rather short and triangular, not grooved, maxillary palpi 6-jointed, labial palpi 4-jointed, tongue short, bifid; pronotum deeply and arcuately emarginate posteriorly, its sides produced to the insertion of the anterior wings and covering the sides of the mesonotum anteriorly, anterior wings with 3 submarginal cells; sagittæ of ♂ armature united; intermediate tibiæ with two calcaria, claws simple. Of this family *Vespa* is the only genus that is really indigenous. A species of *Polistes* was taken by a lady at Penzance in

1866, and recorded by F. Smith in Ent. Ann. 1868, p. 87 but, as suggested by him, it was probably imported, and, as no further captures have been recorded, it appears to have no claim to a place in our list.

VESPA, Linn.

Other generic characters besides those common to the family, are the broad form, the long antennæ of the male, the absence of the small basal lobe of the posterior wings, the truncate base of the first abdominal segment, and the strongly-curved anterior femora. The genus is divided into two natural groups by the form of the face. In one the eyes nearly touch the base of the mandibles, in the other a considerable portion of the cheek is inserted between them; with the exception of the hornet, the species within these groups are very closely allied and often difficult to separate, especially in the ♀ and ♂ sex. I have briefly alluded to their habits of nest-building under the heading of the section. Mr. R. Newstead, who has paid great attention to the parasites and other inmates of wasps' nests, has given an account of the species he has found in them in vol. xxvii. p. 41, of the Ent. Month. Mag. Most of the beetles mentioned, no doubt enter the nests in the imago state, either in search of food or shelter; but a closer relationship has been supposed to exist between *Velleius dilatatus*, one of the largest of our *Brachelytrous Coleoptera*, and the Hornet, *Velleius* having frequently been found in the nests of the latter, but to what extent the beetle is dependent on the Hornet for its existence seems to be at present doubtful. Another *Coleopteron*, *Metacus paradoxus*, is well known as a parasite in the nests of our ground wasps. It lays its eggs in the cells of the wasp, and the larva, when hatched, enters the body of the wasp grub, and in course of time entirely devours it. The life history of this parasite is given by Dr. Algernon Chapman in Ann. Mag. Nat. Hist. for October, 1870.

Wasps, as is well known, are almost omnivorous, but are especially attracted by sweet substances. Mr. Newstead tells me that he once saw a number of *Fuchsia* blooms that had been destroyed by wasps, which had eaten away all the stamens and the pistil, and widened the aperture or mouth of the tube to get at the nectar; some of the wasps he found inside the tube in a complete state of stupor or intoxication. He has also seen *Gladiolus* flowers destroyed by these insects.

Eleven species of *Vespa* occur in Europe, of which six have been taken in this country.

The British species may be thus tabulated:—

(2)	1.	Thorax reddish brown	CRABRO.
(1)	2.	Thorax black and yellow.	
10)	3.	Eyes touching, or nearly touching, the base of the mandibles.	
(9)	4.	Markings of the abdomen black and clearly defined.	
(8)	5.	Scape of antennæ entirely black in the ♀ and ♂, abdomen with pale hairs, dull, tibiæ without long hairs.	
(7)	6.	♂ more pubescent, sagittæ of armature not emarginate at the apex, ♀ and ♂ with a central black line on the clypeus, and with the lateral yellow lines of the pronotum parallel sided	VULGARIS.
(6)	7.	♂ less pubescent, sagittæ emarginate at the apex, ♀ and ♂ with only 3 small black spots on the clypeus, yellow of the lateral lines of the pronotum more or less produced on the outer margin	GERMANICA.
(5)	8.	Scape of antennæ yellow in front, abdomen shining, with thick black hairs, tibiæ with long exserted hairs	AUSTRIACA.
(4)	9.	Black abdominal markings, especially those near the base, more or less undefined, and margined with brown, abdomen shining	Rufa.
(3)	10.	Eyes not nearly touching the base of the mandibles.	
(12)	11.	Clypeus finely and rather closely punctured, with a small black central spot, abdomen without red markings	SYLVESTRIS.
(11)	12.	Clypeus largely and remotely punctured with a broad black central line, abdomen generally more or less red at the base	NORVEGICA.

V. crabro, *Linn.*.—Red-brown; head punctured, yellow,

clothed with long pale hairs, apical margin of mandibles, a line across the face, above the clypeus, and the region of the ocelli, black or dark, antennæ brown, very long in the ♂, the joints bituberculate beneath, scape yellow in front; thorax punctured and hairy like the head, sides of the mesonotum and a narrow central line dark, wings smoky, nervures testaceous; abdomen rather remotely punctured, clothed with pale hairs, apex of the first segment very narrowly and regularly, of the second broadly and irregularly, and the whole of the following segments, except two or three basal spots, yellow, beneath yellow, the segments more or less spotted with brown at the base; legs with projecting hairs, and also clothed with very fine, short, silky pubescence, femora in the ♂ densely fringed with long hairs beneath, anterior pair in both sexes strongly curved.

L. ♂ 23-25 mm., ♀ 25-30 mm., ♀ 18-23 mm.

Nests in hollow trees, outhouses, &c. F. Smith says that it has been known to nest also in a bank; it is local, but generally distributed in the South of England; it has not been recorded from Ireland, and Mr. Newstead says that so far as he knows it has not been taken in Cheshire or North Wales, but Mr. T. A. Chapman saw a specimen at Glencoe in the West Highlands in 1876. Smith mentions that he has seen this species busily at work on a bright moonlight night. Mr. V. R. Perkins says in his list of the Hymenoptera Aculeata of Wotton-under-Edge, that the late Mr. J. H. Cooke of Berkeley told him "that he had lost no less than three hives of bees by these insects, which found their way into the hives, and not only devoured the honey, but destroyed the bees; on removing the hives he discovered in one of them a hornet's nest as large as a good sized turnip."

V. vulgaris, *Lin.*.—Head black, finely punctured, and clothed with long greyish black hairs, mandibles yellow except along their apical margin, clypeus yellow with a

black stripe down the centre, generally widened at the apex, often reduced in the ♂ to a single spot, apical margin black, bidentate in the ♀ and ♂, face above the clypeus with a yellow spot in the sinus of each eye, and a trapezoidal-shaped spot between the antennæ, eyes nearly touching the base of the mandibles, antennæ in the ♂ with a yellow spot on the scape; thorax black, punctured and clothed like the head, sides of the pronotal emargination yellow, the stripe parallel-sided, a spot on the mesopleuræ just below the tegulæ, two spots on the scutellum, two on the metanotum and two on the propodeum yellow; abdomen yellow, dull, clothed with short pale hairs, with a black basal band, angularly produced in the centre, on each segment, with a round black spot on each side of the angle, the black colour often extended so as to enclose the spots; this latter is the normal coloration of the ♂, but both it and the ♀ sometimes have the abdomen marked almost as in *germanica*, segments beneath with a black basal band and two lateral spots below it, these are often united, sagittæ of the ♂ widely spoon-shaped, the apex not emarginate; legs yellow, the femora except at the apex, and the tibiæ inwardly, black.

L. ♂ 17 mm., ♀ 18-20 mm., ♂ 12-15 mm.

Common everywhere.

The parallel-sided stripes of the pronotum and the broad clypeal stripe, widened at the apex, distinguish this species in the ♂ and ♀ from *germanica*, and the form of the armature distinguishes the ♂.

V. *germanica*, Fab.—Very like *vulgaris*, and in some varieties very difficult to separate from it.

♂. This sex may be known from *vulgaris* by the shorter pubescence of its abdomen, and the very differently shaped genital armature, in which the sagittæ are emarginate at the apex, instead of simply rounded; the truncate portion of the basal segment of the abdomen is black, but the dorsal surface has only three small black spots at the

base, the other segments have each a triangular spot in the middle of the base, and a round spot on each side.

♀ and ♂ with a short straight perpendicular black line at the base of the clypeus, and two small black spots below it or with three small spots only, the yellow stripes of the pronotum more or less produced on their external margin; this, I believe, is never the case in *vulgaris*; basal segment of the abdomen with only three black spots, the central one diamond-shaped and extending to the apex of the segment, the second and following segments vary in the extent of the black colour, but have generally a narrow black central spot at the base, sometimes springing from a basal band, and a round dorsal spot on each side.

L. ♂ 17 mm., ♀ 18-22 mm., ♀ 12-16 mm.

Equally common as *vulgaris*. Mr. Newstead says it frequently makes embryo nests in beehives, and that he knows of a case where two nests were placed together in a box, and the colonies united the nests and worked together for many weeks.

V. rufa, *Linn.*.—Allied to the two preceding in the shape of the face, but easily recognized by the indefinite markings of the abdomen, which otherwise much resemble those of *germanica*, by its shining surface, black hairs, and distinctly shorter basal segment; there is also a good character pointed out by Thomson, that the posterior margin of the head is less sharply defined, this character, however, is difficult to appreciate without removing the head. The face is marked very similarly to that of *vulgaris*, but the spots in the sinuations of the eyes are narrower and smaller, and usually only border the front lobe, instead of filling the whole of the sinus, the clypeus is less strongly bidentate; the scutellum, only, bears two spots, and the base of the abdomen is often more or less red, the first and second segments occasionally entirely so, the black markings being margined with reddish brown, which gives them an indefinite appearance. The armature of the ♂ is very different from either of the preceding, being much smaller in pro-

portion to the size of the insects, paler, less shining, the sagittæ broad and parallel-sided, rounded at the apex.

L. ♂ 17 mm., ♀ 18-20 mm., ♂ 12-15 mm.

Common, and generally distributed.

V. austriaca, *Panz.* (*arborea*, *Smith.*)—This species resembles *rufa* in the shining black-haired abdomen and the short cheeks, but the puncturation of the thorax is rather finer, the abdominal black markings are clearly defined, without brown edges, and the basal segment is distinctly longer than in that species, and narrower at the base, being as long or nearly as long as in *vulgaris* and *germanica*; the clypeus is shaped as in *vulgaris* and *germanica*, being produced anteriorly into two almost dentate angles and is coloured like that of the latter, having three black spots only in its centre, the scape of the antennæ is yellow in front, like those of the species in the long-cheeked section, and like these latter the tibiæ are clothed with long hairs.

L. 18-20 mm.

Apparently rare, but has been recorded from Wakefield, Yorkshire; (*Smith*). Leeds; Gloucestershire; (*Perkins*). Cheshire; (*Newstead*). Dublin; (*Carpenter*). Smith says he met with this species in 1836 near Wakefield, Yorkshire, building nests in fir trees. Only females have occurred in Britain. I think there is no doubt that this is the species known on the Continent as *V. austriaca*, as pointed out by André in his "Hymenopteres d'Europe," &c. Our specimens are paler in colour than the Continental ones, but most wasps are variable in this respect; only the ♂ and ♀ are known, and it is suggested that it may be in-quiline in its habits like *Psithyrus*.

V. sylvestris, *Scop.*—Easily known from any of the preceding by the long cheeks between the eyes and the mandibles, which are almost as long as their apical width, and by the scape of the antennæ being yellow in all the sexes.

♂ marked much as in *vulgaris*, but without the meta-

thoracic spots, and with the abdomen rather less elongate, somewhat shining, and less hairy, the genital armature much smaller in proportion, the sagittæ narrow and parallel-sided, shorter than the stipites, which have no apical fringe of hairs, but each terminates in a sharp spine, their inner margins posteriorly are deeply sinuate, and then almost meet and run parallel to each other nearly to the apex; tibiæ with exserted hairs.

♀ and ♂ with the abdomen more regularly banded, and the markings more constant than in any of the preceding, the first segment with a black basal band slightly produced in the centre, second and third each with a broad band slightly produced in the centre, and near each side, fourth and fifth narrowly banded with a slight central angle; the surface is shining as in *rufa* and *austriaca*; clypeus with only a single, small, central spot; tibiæ with long exserted hairs.

L. ♂ 15 mm., ♀ 18 mm. ♀ 15 mm.

This species hardly varies in its markings; it is common in many localities, and frequents the flowers of *Scrophularia*. It makes its nests in the branches of trees; but Smith says that he has once or twice found it inhabiting an underground nest, and that it is very partial to the flowers of *Ballota nigra*.

Mr. Newstead records an embryo nest of this species built of blue paper, taken by Mr. A. O. Walker at Colwyn Bay in 1892, and now in the Grosvenor Museum, Chester.

V. norvegica, *Fab.*—Closely allied to *sylvestris*, but distinguishable from that species by the broad black centrally dilated stripe down the middle of the clypeus, which is also more remotely punctured than in *sylvestris*, and by the band of the second abdominal segment, which is laterally abbreviated and often terminates in a red spot; besides these general characters the ♂ has much longer antennæ, and the armature is very differently formed; the stipites have their inner margin slightly sinuate near

the middle, and distant from each other throughout their length, each terminates in a spine, and is densely fringed with hairs above it; in the ♀ and ♂ the abdomen is rather shorter than in *sylvestris*, and there is usually a certain amount of rufous colouring on the sides of the first and second segments, all the black bands are produced posteriorly near the sides into a spot-like enlargement, and occasionally the spot is distinct from the band; the tibiae have long exserted hairs in both sexes.

L. 14-15 mm., ♀ 17-18 mm., ♂ 12-14 mm.

This species is widely distributed in the West and North, but rarer in the South-East. It generally builds in gooseberry, currant, or other bushes. It has been recorded from Maidstone; (*Frisby*). Sittingbourne; (*Chitty*). Hastings. Wilton, Norfolk; (*Bridgman*). Colchester; (*Harwood*). Shirley; (*Rothney*). Saltash; Egg Buckland; Alphington, near Exeter; Ponsanooth, St. Austell, Trevarrick, Grampound, Gunnislake, Cornwall; (*Bignell*). Tavistock; Morthoe; (*Swale*). Yorkshire; (*Fowler*). Lancashire and Cheshire; (*Gardner*). Scotland, abundant (*Smith*). Ireland; (*Smith*).

Mr. Bignell in a letter mentions a nest of this species in a horse-chestnut tree, forty feet from the ground, and also says that a nest he found near Saltash "was re-built to all outward appearance in seven days." Mr. Newstead records a nest of this species in the corner of an old window.

EUMENIDÆ.

Species not social; nest made by only one ♀; eyes deeply sinuate on their inner margin, mandibles elongate, deeply grooved longitudinally, antennæ in the ♂ often spirally rolled, or hooked at the apex; pronotum very deeply emarginate posteriorly, the side pieces overlapping the mesonotum, and extending to the insertion of the wings, wings with three submarginal cells, posterior pair with a

small lobe at the basal angle; abdomen sub-clongate, the basal segment narrower than the second, not sharply truncate at the base as in *Vespa*, genital armature of the ♂ with the stipites elongate and more or less spiniform.

There are two genera recorded from this country, which may be distinguished thus:—

1. Abdomen not, or scarcely, petiolated, basal segment more than half the width of the second ODYNERUS.
2. Abdomen petiolated, basal segment not half so wide as the second EUMENES.

ODYNERUS, Latr.

Easily known from Eumenes, the only other British genus of this family, by the comparatively wide first segment of the abdomen, which has no elongate petiole as in that genus. The British species are clearly divisible into the three sections defined by Wesmael, viz., *Hoplopus*, *Ancistrocerus* and *Synmorphus*; there is a fourth section defined by Saussure, viz., *Leionotus*, but hitherto there has been no authentic record of it having been found in this country. There are twelve British species, but the *Palæ-arctic* species are very numerous, and their number probably quite problematical, as there is a great general resemblance between them all, and great care and study is necessary to differentiate the species with certainty. One of the most important characters lies in the form of the second ventral segment of the abdomen, this has a transverse sulcature at some little distance from the base, crossed by a series of carinæ; the length of these carinæ and the shape of the segment offer very constant and reliable characters. Several of the species are subject to the attack of the parasitic genus *Chrysis*. The following is the table of the British species:—

- (10) 1. Basal segment of abdomen without a transversed carina at the base; antennæ in the ♂ spirally rolled at the apex (Subg. *Hoplopus*, Wesm.).

- | | | | |
|------|-----|--|-----------------|
| (3) | 2. | Abdomen red at the base . . . | BASALIS. |
| (2) | 3. | Abdomen not red at the base. | |
| (5) | 4. | Intermediate coxæ of ♂ with a long yellow spine; clypeus in the ♀ with a yellow basal band . . . | RENIFORMIS. |
| (4) | 5. | ♂ coxæ simple; ♀ clypeus black. | |
| (7) | 6. | ♂ femora simple; pronotum, in both sexes, truncate in front, its angles prominent . . . | LEVIPES. |
| (6) | 7. | Intermediate femora strongly dentate in the ♂; pronotum in neither sex truncate in front, nor with its angles prominent. | |
| (9) | 8. | Larger, markings yellow, pubescence of head and thorax denser and dark . . . | SPINIPES. |
| (8) | 9. | Smaller, markings nearly white, pubescence of head and thorax pale . . . | MELANOCEPHALUS. |
| (1) | 10. | Basal segment of abdomen with a transverse carina at the base. | |
| (24) | 11. | Apical joint of the antennæ in the ♂ sharply reflexed; basal segment of abdomen clothed with long hairs (Subg. <i>Ancistrocerus</i> , Wesm.). | |
| (13) | 12. | Second ventral segment, viewed sideways, elevated and distinctly angulated beyond the basal sulcature . . . | CALLOSUS. |
| (12) | 13. | Second ventral segment, viewed sideways, straight or gradually convex beyond the basal sulcature. | |
| (15) | 14. | Second ventral segment, viewed sideways, not longitudinally convex, but straight or even slightly concave; costæ of basal sulcature very short . . . | PARIETUM. |
| (14) | 15. | Second ventral segment, viewed sideways, convex, costæ of sulcature longer. | |
| (23) | 16. | Sides and apical concavity of propodeum dull. | |
| (18) | 17. | Posterior tibiæ narrowly black or brown at the base . . . | TRIPASCIATUS. |
| (17) | 18. | Posterior tibiæ pale at the base. | |
| (20) | 19. | Abdomen with only three yellow bands . . . | TRIMARGINATUS. |
| (19) | 20. | Abdomen with many yellow bands. | |
| (22) | 21. | Basal segment of abdomen wide, its apical band in the ♀ linear throughout . . . | PICTUS. |

- | | | | |
|------|-----|--|---------------|
| (21) | 22. | Basal segment of abdomen narrow, its apical band in the ♀ suddenly and widely dilated at the sides | PARIETINUS. |
| (16) | 23. | Sides and apical concavity of propodeum shining | ANTILOPE. |
| (11) | 24. | Antennæ simple in both sexes, basal segment of abdomen not clothed with long hairs, and with a slight central fovea near its posterior margin (Subg. <i>Symmorphus</i> , Wesm.). | |
| (26) | 25. | Larger, mesopleuræ shining and almost impunctate | CRASSICORNIS. |
| (25) | 26. | Smaller, mesopleuræ distinctly punctured. | |
| (28) | 27. | Abdomen with only three yellow bands | SINUATUS. |
| (27) | 28. | Abdomen with many yellow bands | GRACILIS. |

(SUBG. HOPLOPUS.)

O. spinipes, *Linn.*.—Black, clothed with greyish black hairs; head closely punctured in the ♂, with the clypeus, mandibles and labrum, a narrow band between the antennæ, scape and second joint of the antennæ beneath yellow, the third to the seventh more or less ochreous beneath, the ninth to the thirteenth flattened and forming a spiral roll; ♀ with only a narrow band or two spots between the antennæ yellow. Antennæ simple, black; clypeus in the ♂ strongly bidentate, in the ♀ very slightly so, thorax closely and rugosely punctured, anterior angles of pronotum scarcely produced, collar yellow, tegulæ in the ♀ yellow posteriorly, wings smoky in the basal cells, nervures dark-brown; abdomen rugosely punctured on the basal segment, and clothed with longish hairs, ♀ with a small fovea near the posterior margin, the other segments shining and very finely punctured, all the segments with a narrow simple apical band, except the apical one, those of the ♂ more or less abbreviated on the third and following segments; legs with the femora black, yellow at the apex, intermediate pair in the ♂ dilated,

the dilatation with two deep almost semicircular incisions, leaving three distinct teeth, of which the basal is the longest and narrowest, and points outwards, away from the body, the apical is broad and somewhat rounded, and points inwards, towards the body, the central one is somewhat truncate, the femora in the ♀ are simple, tibiae yellow, more or less stained with black inwardly towards the apex, tarsi yellow in the ♂, dusky in the ♀.

L. 13-14 mm.

Not uncommon and generally distributed, makes its nests in banks, and furnishes the mouth of its burrow with a curved projecting tubular entrance of very beautiful construction, composed of minute pellets of mud and very fragile, which would apparently be destroyed by the first heavy rain.

O. melanocephalus, *Gmel.*—Very like *spinipes*, but smaller, with the pubescence of the head and thorax less dense, and almost white, and with the abdominal bands whitish or pale cream-coloured, not yellow, that of the second segment considerably dilated at the sides; other distinguishing characters of the ♂ are the pale apical joints of the antennæ beneath, the form of the intermediate femora, whose central tooth is pointed, and not widely truncate, and the flatter, punctured second ventral segment of the abdomen, which bears a slight central tubercle. The ♀ may be further distinguished from *spinipes* by the almost truncate apex of the clypeus and by the pale underside of the antennæ.

L. 9-10 mm.

Not a common species; it nests in bramble stems. Deal; Hastings. Isle of Wight; Bristol; (*Smith*). Norfolk; (*Bridgman*). Colchester; (*Harwood*). Seaton; Weymouth; Lulworth; (*Dale*).

O. lævipes, *Shuck.*—Like the two preceding in general colour, with yellow abdominal bands as in *spinipes*, but at once recognizable by the simple intermediate femora and

the anteriorly yellow intermediate and posterior coxæ of the ♂, by the laterally produced anterior angles of the pronotum, the larger, squarer vertex of the head, and the linear second abdominal band of both sexes, and by the deeply emarginate clypeus, more truncate pronotum and densely punctured second ventral segment of the ♀. The pronotum in both sexes bears a narrow pale line anteriorly, which extends almost, or quite, to the lateral angles.

L. 10 mm.

Rare; nests in bramble stems, lining its burrows with a coating of fine sand. Hampstead; Bristol; (*Smith*). Hollington, near Hastings.

O. reniformis, *Gmel.*—Black, head and thorax rugosely punctured and clothed with short pale hairs; clypeus deeply emarginate and entirely yellow in the ♂, slightly emarginate in the ♀, with a broad transverse yellow band at the base, both sexes with the scape of the antennæ in front, and a transverse spot on the face, just above their insertion yellow, ♂ with the flagellum beneath also pale, as well as the extreme apices of its sixth and following joints; pronotum anteriorly with a yellow band, its anterior angles scarcely indicated, tegulæ, except a small brown spot on their external margin, a spot on the mesopleuræ, sometimes scarcely visible in the ♂, and a broad band on the postscutellum in both sexes, and on the scutellum in the ♀ yellow, the scutellar band in the ♂ only faintly indicated, a spot on each side of the propodeum also yellow, wings with the costal nervure reddish testaceous, and the median and posterior nervures near their base of the same colour, costal nervure with a very small yellow basal spot; abdomen with the basal segment rugosely and somewhat largely punctured, the rest more finely so, each with a rather wide apical yellow band, especially in the ♀, that of the first and second widely dilated at the sides, of the others only slightly so;

intermediate coxæ of the ♂ yellow, produced into a long yellow spine, femora yellow, black at the base, tibiæ and tarsi yellow.

L. 12-13 mm.

Very rare; has occurred near Chobham, Surrey, in two localities, and Mr. Billups has taken it near Virginia Water Station, about four miles from Chobham. The yellow spines on the coxæ of the ♂ and the broad yellow band of the clypeus of the ♀ at once distinguish this species from its allies; it makes curved tubular entrances to its burrows; these I have only once met with on a level sandy spot on Chobham Common.

O. basalis, *Smith*.—Black, more strongly punctured than any of the preceding; head with a spot between the antennæ, a line in the lower part of the sinus of each eye, and a spot behind each eye yellow, antennæ beneath testaceous in both sexes, ♂ with the rather deeply emarginate clypeus, and scape in front pale yellow, and only with the penultimate and apical joints of the antennæ recurved; thorax very largely and closely punctured, pronotum with an anterior band, the tegulæ, a double transverse spot at the apex of the scutellum, and in the ♀ a transverse line on the postscutellum, pale yellow, wings smoky in front, nervures brown, reddish testaceous towards the base; abdomen largely punctured, especially on the basal segment, which is red, except a black central line and the apical pale yellow band, the following four segments have each a pale apical band, that of the second segment slightly dilated at the sides; legs simple in both sexes, reddish testaceous.

L. 12-13 mm.

Very rare. Mr. Rothney took a ♀ on Stowborough Heath, Dorsetshire, on the 24th of July, 1878, and Mr. Dale has taken the ♂ in the Isle of Portland. I know of no other records of its capture, and of none of its habits.

(SUBG. ANCISTROCERUS.)

O. callosus, *Thoms. (quadratus Smith, nec Panz?)*.—Black, punctured, clothed with greyish hairs; mandibles and clypeus in the ♂ yellow, margined with black, the former deeply emarginate, in the ♀ black often with two or four yellow spots on the latter, its apex almost truncate, scape of the antennæ in front, a spot between the antennæ, and generally a small spot behind each eye, in both sexes, yellow; pronotum with an apical band, the scutellum generally with two spots, a small spot on each tegula, and often a spot on the mesopleuræ yellow; abdomen slightly shining, clearly and distinctly punctured, all the segments except the terminal one with a yellow apical band, that on the first suddenly and rectangularly dilated at the sides, second ventral segment with the longitudinal costæ of the transverse sulcature rather long, its surface beyond the sulcature suddenly elevated and angulated, and then straight or slightly concave to its posterior margin; femora yellow at the extreme apex, tibiæ and tarsi yellow, the former sometimes black at the apex inwardly. All the markings are liable to variation.

L. 9-13 mm.

One of our commonest species, but often confounded with the following—the form of the basal abdominal band in this species is pretty constant; but the same form occurs in *parietum*, *trifasciatus*, and *parietinus*, so that it is not to be trusted as a specific character.

O. parietum, *Linm.*—Very like the preceding, but rather more robust, the basal segment of the abdomen being proportionately rather wider; it is very variable in colour, so that no dependence can be placed on that character, the band of the basal segment of the abdomen is, however, as a rule, angularly not squarely notched in the centre; the form of the second ventral segment of the abdomen will

separate it at once from its allies, the longitudinal costæ of its transverse sulcature are very short, and the surface of the segment, beyond the sulcature, is not raised above the level of the latter, and is quite flat, or, if anything, concave longitudinally; in all the following species the segment is more or less convex longitudinally.

L. 8-14 mm.

Very common, and generally distributed.

O. pictus, *Curt. (oviventris, Thoms.)*.—Very similarly marked to the other species of the genus, but with the yellow colouring less abundant than in either of the preceding; as a rule, the thorax is entirely black, except the anterior margin, which bears a narrow, yellow line; the abdominal bands are all linear throughout, and occur on the first five segments, the sixth in the ♀ has an apical spot, the second ventral segment has long, very strong costæ, across its transverse sulcature, and is rather strongly convex behind it; the tibiæ and tarsi in the ♀ are reddish-yellow, and are unspotted in both sexes; the basal segment is unusually wide in this species, and formed much as in *parietum*, from which the narrow abdominal bands, long costæ and convex form of the second ventral segment at once distinguish it.

The broad basal segment, combined with the many-banded abdomen, distinguishes it from any of the following.

L. 10-13 mm.

Not common; Wandsworth. Bristol; Isle of Wight; Portland; Weybridge; (*Smith*). Colchester; (*Harwood*). Rugby; (*Morice*). Plymouth and Bolthead; (*Bignell*). Lancashire and Cheshire; (*Gardner*). Oxford; (*R. C. L. Perkins*). Hastings; (*Frisby*). Gloucestershire; (*Perkins*). Norfolk; (*Bridgman*). Perth.

O. trimarginatus, *Zett.*—Like *pictus*, in the form of the second abdominal segment, but rather more elongate, and with the basal segment of the abdomen narrower in

proportion to the second, and to its own length, the puncturation of the second and following segments is larger and more distinct, and only the first three segments bear yellow bands, which are wider than those of *pictus*, that of the basal segment sometimes dilated at the sides; the tibiæ in both sexes are unspotted, and reddish testaceous, or more or less tinged with that colour.

L. 10-13 mm.

Apparently chiefly a maritime species. Littlehampton; Worthing; Hayling Island; Deal; Herne Bay. Walmer; Lundy Island; (*Smith*). Lowestoft; (*Morice*). Hastings; (*Frisby*). Gloucestershire; (*Perkins*). Norfolk; (*Bridgman*). Lancashire and Cheshire; (*Gardner*). Loch Rannoch, Isle of N. Uist; (*Dale*). Scilly Isles; (*Marshall*). Land's End; (*Marquand*).

O. trifasciatus, *Oliv.*—This species, allied to *trimarginatus* in the form of the abdomen, and the number of its bands may be distinguished by its longer thorax, which in the ♀ is nearly twice as long as wide; by its yellow tibiæ, of which the intermediate and posterior pairs are black or dusky at the extreme base, and widely black at the apex and inwardly in the ♀, or bear a black spot inwardly, spreading from the apex in the ♂, and by the more or less dusky tarsi in both sexes, these in the ♀ sometimes nearly black; the anterior tibiæ are also black posteriorly in both sexes.

L. 8-12 mm.

Chobham. Hastings; London District; (*Smith*). Land's End; (*Marquand*). Colchester; (*Harwood*). Glanvilles Wootton; Dorset; (*Dale*). Rugby; (*Morice*). Norfolk; (*Bridgman*). Gloucestershire; (*Perkins*). Lancashire and Cheshire; (*Gardner*).

Smith says it forms its burrows in old palings.

O. parietinus, *Linn.*—Like *trifasciatus* in the coloration of the legs, but with the bases of the tibiæ yellow; it is a much larger, more robust species, with all the coxæ

in the ♂ yellow, or spotted with yellow in front; the abdomen in both sexes, with all the segments broadly banded with yellow, except the apical one, and that in the ♀ has a round yellow spot. The basal band in the ♀ is widely dilated at the sides, as in *callosus*, and the thorax is also much wider in proportion to its length than in *trifasciatus*, and the clypeus has a yellow spot on each side of its base, sometimes connected into a band, whereas in *trifasciatus* it is almost always entirely black. Sides and apical concavity of the propodeum dull, the former rugose.

L. 12–16 mm.

Chobham; Chialehurst; Bromley; Reigate; Southwold; Bournemouth. Bury St. Edmunds; (*Tuck*). Norfolk; (*Bridgman*). Gloucestershire; (*Perkins*). Rugby; (*Morice*). Colchester; (*Harwood*). Hastings; Maidstone; (*Frisby*). Lancashire and Cheshire; (*Gardner*). Perth.

O. Antilope, *Panz.*—About the same size as *parietinus*, and very like that species in colour, but differing from it in both sexes by the shining sides and apical concavity of the propodeum, and the much shorter costæ of the sulcature of the second abdominal segment; also in the ♀ by the shape of the band of the basal segment, which is somewhat trisinate, or rarely simple, not squarely notched in the centre, as in that species, and in having no distinct band on the fifth segment, although in place of it there is often a small central spot.

L. 13–18 mm.

The largest species of the genus, and separable from any other, as pointed out by Thomson, by the shining sides and apical concavity of the propodeum.

I do not think this species is common in the South-East of England, at any rate, I have never met with it. It has, however, been taken at Maidstone; (*Frisby*). Colchester, not uncommon on Raspberry flowers; (*Harwood*). Lynn, Norfolk; (*Bridgman*). Barmouth, and “common in Yorkshire;” (*Smith*). Oxford and Chippenham; (*R. C. L.*

Perkins). Braunstone, Leicestershire; *Botusfleming*; (*Marshall*). Land's End; (*Marquand*). Exmouth; *Whitsand Bay*, Plymouth; (*Bignell*). Gloucestershire; (*Perkins*). Glanvilles Wootton; (*Dale*), who records that a specimen of this species having made a nest in his mother's work-basket, used regularly to fly to the window, and knock against it to be let in and out.

(SUBG. SYMMORPHUS.)

O. crassicornis, *Panz.*—Black, shining, head and thorax clothed with short brownish-grey pubescence, finely and irregularly punctured with a few larger shallower punctures interspersed, antennæ simple, somewhat clavate in both sexes; mandibles and clypeus in the ♂, a large basal spot on the strongly bidentate clypeus of the ♀, the scape of the antennæ in front in both sexes, though sometimes only partially in the ♀, and a small spot between them, ferruginous yellow; pronotum with a spot on each side, tegulæ, two spots on the largely-punctured scutellum, and a spot on the mesopleuræ, under the wings, ferruginous yellow, mesopleuræ shining, almost impunctate, wings smoky, propodeum very rugose; abdomen clothed with very fine silken pubescence, basal segment, without long erect hairs, very largely punctured, much narrower than the second, its apical margin somewhat raised and rounded, and bearing a ferruginous yellow band, which is slightly widened in the centre, just above it is a small, rather indefinite central fovea, second and following segments finely punctured at the base, more largely at the apex, each with a wide sinuate band, second much constricted at the base, its sides much rounded, in its widest part not quite twice as wide as the basal segment; femora black, their apices and the tibiæ and tarsi ferruginous, intermediate tibiæ with a black stain on their inner margin.

L. 12–14 mm.

Very rare; near Darent Wood, entering a hard sand-

bank (*Smith*). I have specimens from Shuckard's Collection without note of locality; the only recent examples I know of are a ♂ taken by Mr. Harwood at Colchester, and a specimen taken at Abergavenny by Dr. Algernon Chapman.

O. gracilis, *Brullé*, (*elegans* *Wesm.*).—Much smaller and more elongate than the preceding, the yellow colour brighter and paler, and the mesopleuræ punctured. Black, clothed with very short brownish-yellow pubescence, anterior margin of the pronotum slightly rounded in the centre, its angles produced, a spot on each side extending to the angle in the ♀ yellow, mesonotum strongly punctured, with four distinct longitudinal impressions, the two central ones extending along its entire length, the two outer ones extending from the base to about the middle, scutellum with two yellow spots, mesopleuræ shining, each with a yellow spot, surrounded posteriorly by a clearly defined crenate impression, surface within the impression rather closely, and regularly and finely punctured, outside it coarsely and irregularly, propodeum very rugose, wings slightly smoky, especially anteriorly; abdomen with five somewhat sinuous yellow bands in the ♂, four in the ♀, basal segment very largely and rugosely punctured, its apical band generally narrowest in the centre, with a deep longitudinal fovea near its apex, rest of the abdomen more finely punctured; legs with the femora black, pale at the extreme apex, tibiæ yellow, with a black mark on their inner margin, tarsi dusky, their base paler.

L. 8–11 mm.

Chobham. Guestling, near Hastings; (*Frisby*). Norfolk; (*Bridgman*). Colchester; (*Harwood*). Yorkshire. Gloucestershire; (*Perkins*). Cornworthy; (*Marshall*). Christow, Devon; (*Parfitt*). Land's End; (*Marquand*). Lundy I.; (*Smith*).

O. sinuatus, *Fab.* (*bifasciatus*, *Wesm.*).—Very like the preceding, but easily distinguished by having only three

yellow abdominal bands in either sex, by the somewhat dull, very largely punctured mesopleuræ throughout, and the want of the well-defined crenature, and by the darker tibiæ, which are pale only near the base; the ♀ may also be known by the much shorter third joint of the antennæ, which is not nearly twice so long as the second and by the less prominent, black, anterior angles of the pronotum.

L. 8–11 mm.

Not very common, but widely distributed.

Colchester; (*Harwood*). Hastings, not rare; (*Frisby*). Norfolk; (*Bridgman*). Glanvilles Wootton, once bred from an oak apple; (*Dale*). Exminster; Buckleigh; (*Bignell*). Lancashire; (*Gardner*). Perth.

EUMENES, Latr.

There is only one British species of this genus, and it may be known at once from *Odynerus*, by the absence of the apical concavity of the propodeum and by the very narrow petiolated basal segment of the abdomen, which is not nearly half so wide as the second; the antennæ of the ♂ terminate in a hook or reflexed apical joint, much as in the *Ancistrocerus* section of the genus *Odynerus*. Makes small mud nests, which it attaches to stems of heath or other plants.

E. coarctata, *Linn.*—Black, rugosely punctured, head and thorax clothed with short brownish hairs, clypeus and scape of the antennæ in front in the ♂, a spot at the base of the clypeus in the ♀, and a spot between the antennæ in both sexes yellow; thorax with a pronotal band in front, tegulæ outwardly, a spot on the mesopleuræ, the post-scutellum, and often a spot on each side of the propodeum yellow; abdomen with the basal segment closely and rugosely punctured, clothed with brown hairs like the thorax, narrowly petiolated, campanulate, with a slight longitudinal channel, its apical margin raised, smooth, and yellow, and there is sometimes a yellow spot near the centre of each side, second and following segments punctured, but more

finely and less closely than the first, more or less shining, and clothed with short pale hairs, each with a yellow apical band; second very convex and swollen, three times as wide as the first, with a yellow transverse spot on each side near the base; femora black, yellow at the extreme apex; tibiæ and tarsi yellow.

L. 13–15 mm.

Local. Chobham, Woking. Blackwater and Parley Heath, Hants; Sandhurst, Sunning Hill, Weybridge, (Smith). Bournemouth and Stowborough Heath (Rothney).

ANTHOPHILA.

This section is chiefly composed of the bees or *Aculeata* that store up pollen and honey for their larvæ, but it also includes certain *Aculeata* that live with them in the same nests or lay their eggs in the same cells, and which are known as *inquilines* or messmates. Amongst them are found the Hive Bee, the Humble Bees, and their messmates, which are social in their habits, the other genera are solitary. In general structure the *Anthophila* vary very little, and in this respect are very unlike the *Fossores*, also there is such a distinct family likeness between them that it is rarely that even a beginner can doubt as to whether one of his captures is a bee or not, although such doubts might exist over a *Sphecodes* or *Prosopis*, the former being coloured like a *Tachytes* or a *Gorytes tumidus*, and the latter bearing a slight resemblance to a black *Crabro*. The species as a rule are densely hairy, which of course gives them at once an *Anthophilous* character, but this is not so always; many of the *inquilines*, as well as *Sphecodes* and *Prosopis* being nearly glabrous; the cibarial arrangements of the *Anthophila* also as a rule distinguish them from the other *Hymenoptera*, as the tongue is generally pointed and often very elongate, as well as the maxillæ, &c., but here again these characters are not co-extensive with the section,

Prosopis and *Colletes* having bifid tongues like those of the *Diploptera* and *Fossors*. There are two points of structure which may be relied upon as characteristic of this section throughout; these are the dilated posterior metatarsi, and the plumose hairs of the thorax; the former of these characters is somewhat indistinct in the ♂ of *Andrena*, and of some other genera, but the latter, at least so far as the British species are concerned, is always reliable, and only requires sufficient magnifying power to disclose it. So far as I have been able to examine exotic species, it also holds good, but to this, like all other single characters, these are probably exceptions, and it is in combinations of peculiarities of structure as well as of habits that we have to seek satisfactory characters of a sectional nature. The generic characters in the *Anthophila* are chiefly derived from the tongue and mouth parts; these appear to be very constant, and differ much in the various genera. Some genera, like *Halictus* and *Sphecodes*, have short tongues, no distinct lora, and cylindrically-jointed labial palpi; others, like the higher *Apidæ*, have long tongues, well developed lora, and sheath-like labial palpi which fold over the tongue. I think it is clear that the *Obtusilinguæ* should immediately follow the *Diploptera*, but beyond that it is almost impossible to make any satisfactory linear arrangement. Such genera as *Colletes*, *Rhophites*, *Panurgus*, *Nomada*, *Macropis*, and *Ceratina* upset any scheme which one can invent. It is not therefore because I think the present arrangement satisfactory that I adopt it, but simply because I cannot suggest a better.

The *Anthophila* may be thus characterized:—Species social or solitary. If social, communities consisting of male, female, and worker, except in the case of *Psithyrus* (the messmate of the Humble Bee), where no worker occurs; tongue short and bifid, short and pointed, or elongate and filiform, with or without a terminal enlargement; labial palpi generally 4-jointed, cylindrical, or

with the basal joints sheath-like, maxillary palpi very variable in the number of their joints, mandibles very variable in form; compound eyes large and well-developed, ocelli three, antennæ simple, 13-jointed in the ♂, 12-jointed in the ♀; thorax broad, pronotum short and collar like, wings present in both sexes, and not folded longitudinally when at rest; abdomen elongate or ovate, rounded or subtruncate at the base, except in *Apis*, where it is sharply truncate, as in *Vespa*; seven dorsal segments visible in the ♂, six in the ♀, ventrally the eighth segment often forms the termination of the abdomen in the ♂, the seventh being very short, and hidden beneath the sixth, or almost so. In *Megachile* and the genera where the anal aperture in the ♂ is inferior, frequently only three or four segments are exposed ventrally. The terminal ventral segments in the ♂ afford excellent characteristics, as well as the genital armature, which is very variable in form, pollen collecting hairs sometimes situated on the ventral segments of the abdomen, sometimes on the posterior tibiæ and tarsi, or on the femora of the ♀, absent only in the inquiline genera; posterior tibiæ in some genera furnished with a *patella* or flattened disc at the extreme base outwardly, posterior metatarsi more or less dilated. The tongues and mouth parts of our British *Anthophila* will be found figured and described in the Linnean Society's Journal, Zool. vol. xxiii. pp. 410-432, pls. 3-10.

The *Anthophila* are separable into two natural divisions, the *Obtusilingues* and *Acutilingues*, by the forms of their tongues; I have adopted these as primary divisions of this section, although they were only created as subdivisions of the *Andrenidæ*, feeling that their characteristics are far more important and better defined than those which separate the two families *Andrenidæ* and *Apidæ*, which are here treated as families of the *Acutilingues*.

- (2) 1. Tongue short, obtuse, bifid **OBTUSILINGUES.**
 (1) 2. Tongue pointed and acute, or elongate **ACUTILINGUES.**

OBTUSILINGUES.

There is only one family in this division.

COLLETIDÆ.

Of this family there are only two British genera, very unlike each other in general appearance, one, *Prosopis*, being composed of small, almost glabrous, black species; the other, *Colletes*, being densely hairy on the head and thorax, and much larger in size, but both are alike in the obtuse tongue, which is sub-triangular, widest anteriorly, with its anterior margin largely and angularly emarginate; this character separates them at once from all the members of the *Acutilingues*; they are also alike in the strangely modified seventh and eighth ventral segments of the abdomen.

- | | | | |
|-----|----|---|-----------|
| (2) | 1. | Species with the head and thorax densely hairy, anterior wings with three submarginal cells . | COLLETES. |
| (1) | 2. | Species nearly glabrous, anterior wings with two submarginal cells | PROSOPIS. |

COLLETES, Latr.

Head and thorax densely hairy, tongue short, deeply emarginate, paraglossæ acute, their anterior margin fringed with long hairs; maxillary palpi six-jointed; labial palpi four-jointed, all the joints subequal and cylindrical, submentum hyaline, lora composed of the thickened convex, apical portion of the membrane which connects the cardines, labrum transverse; anterior wings with three submarginal cells, and with the marginal cell slightly appendiculate; abdomen usually banded with whitish pubescent bands, although these are absent in *cunicularia*, ♂ with the seventh ventral segment terminating in two wing-like appendages, eighth produced into a narrow compressed process, hairy at the apex, genital armature with the stipites apparently two-jointed, sagittæ with a more or

less extended membranous wing; these terminal segments and armature afford excellent specific characters; posterior femora and tibiæ in the ♀ densely clothed beneath with long pollinigerous hairs; tibiæ without a patella.

The species of this genus burrow in the ground, mostly choosing hard sand-banks and sometimes forming extensive colonies; they make straight simple tunnels, and line their cells with a sort of membranous material. F. Smith in his "Catalogue of the British Bees," 1876, says that their burrows are from eight to ten inches in depth, that the cells are usually five to eight in number, and that there is little doubt that the same bee constructs more than one tunnel. The hairs of the bees of this genus are amongst the most beautifully-branched of any of the *Anthophila*. The species of *Epeolus*, a genus of the *Acutilingues*, are parasitic upon certain of the species of this genus. There are six British species which may be thus tabulated:—

- | | | | |
|------|----|---|------------|
| (10) | 1. | Small species, 8-10 mm.; abdomen with distinct pale apical bands on the segments. | |
| (9) | 2. | Basal segment of the abdomen closely punctured. | |
| (4) | 3. | Sixth abdominal ventral segment in the ♂ with a small, well-defined deep fovea on each side near the apex; ♀ with the abdomen shining, basal segment finely punctured; all the segments pale at the apex. | |
| (3) | 4. | Sixth abdominal segment in the ♂ simple or with large shallow depressions; ♀ with the basal segment dull and coarsely punctured, or with the apices of the segment black. | SUCCINCTA. |
| (8) | 5. | ♂ with the sixth ventral segment impressed on each side and subfoveated; ♀ with the thoracic hairs bright brown, abdomen scarcely shining. | |
| (7) | 6. | Sixth ventral segment in the ♂ shining, not deeply punctured, the other segments beneath depressed and shining, their apical fringes interrupted in the middle; ♀ with the abdomen dull, first segment clothed on its basal half with long pale hairs | FODIENS. |

- (6) 7. Sixth ventral segment in the ♂ less shining, strongly and largely punctured, the apical fringes of the other segments entire; ♀ with the abdomen less dull, basal segment naked except at its extreme base PICISTIGMA.
- (5) 8. ♂ with the sixth segment beneath simple, ♀ with the thoracic hairs dull greyish brown; abdomen somewhat shining MARGINATA.
- (2) 9. Basal segment of abdomen finely and remotely punctured DAVIESANA.
- (1) 10. Large species, 14-15, mm.; abdomen with only very indistinct paler apical bands CUNICULARIA.

C. succincta, *Lin.*.—♂ black, subelongate, head and thorax densely clothed with pale-brown hairs, head finely punctured; antennæ with the basal joint clothed with long hairs, joints of the flagellum distinctly longer than wide; mesonotum including the scutellum largely and deeply punctured, propodeum rugose; abdomen closely punctured coarsely on the basal segment, which also, especially at the base, is clothed with long pale hairs, each segment with an apical band of pale pubescence, segments beneath somewhat shining, punctured, not depressed, apical pubescent bands entire, fifth segment slightly emarginate, sixth with a small deep subapical fovea on either side; stipites of armature stout, bearing a narrow apical hairy process; sagittæ wide at the base, each with a narrow membranous wing at the side which does not reach the apex; tarsi with the joints considerably longer than wide, clothed with a few long hairs, and pale spines round the apex of each joint.

♀ larger and more robust, and with the hairs of the head and thorax rather brighter in colour than in the ♂; cheeks between the eyes, and mandibles rather longer than in the next species; abdomen slightly shining, basal segment finely and closely punctured, clothed with long pale hairs at its base, its apical margin generally pale, and clothed laterally with pale hairs, the other segments more finely punctured than the basal, each pale at the apex, and bearing

a band of whitish hairs, the second also with a well-defined basal band.

L. 9-11 mm.

Occurs in August on commons, frequents the flowers of the common heath, and is generally distributed.

C. fodiens, *Kirb.*—♂ differs from the preceding in having the antennæ slightly shorter, the sixth ventral segment of the abdomen not distinctly foveated, but with a wide shallow lateral depression on either side, all the segments beneath very shining, flat, their apical halves slightly impressed, and the pubescent bands interrupted, armature with the stipites much longer, and without an elongate apical hairy process, sagittæ about as long as the stipites, their wings extending to the apex, legs more hairy, tarsi with the joints wider, being nearly as wide as long.

♀ differs from *succincta* in the more brightly-coloured hairs of the thorax, the dull much more rugosely punctured abdomen, the concolorous apical margins of the segments, although that of the first is sometimes narrowly testaceous, the wider more ochreous pubescent bands, the basal one of the second segment sometimes wanting, and the shorter cheeks; the clypeus also is more densely hairy, and slightly emarginate.

L. 9-10 mm.

Frequents *Senecio*, *Tanacetum*, &c., and occurs in July and August. Southwold; Hayling Island; Bournemouth; Littlehampton. Barmouth; (*Smith*). Lowestoft; (*Morice*). Norfolk; (*Bridgman*). Bridgenorth; Salcombe; (*Marshall*).

C. picistigma, *Thoms.*—Closely allied to both the preceding; the ♂ may be known from *succincta* by its shorter antennæ, its unfoveated sixth ventral segment, and by the stipites which have no apical hairy process; the sagittæ are also differently formed; from *fodiens* by the less flat, duller surface of the ventral segments, and their entire

fasciæ, the sixth largely punctured, and widely impressed apically at each side, and by the stipites of the armature which are considerably shorter than the sagittæ; the ♀ from both *succincta* and *fodiens* in the coal-black colour of the abdomen, this is dull, with close subrugose puncturation and concolorous margins like *fodiens*, from which it differs in the wider more cordate form of the abdomen, the larger deeper puncturation of the basal segment, the absence of long pale hairs on its basal half, and in the white colour of the bands.

L. 9-10 mm.

July and August; Southwold; Hastings; Falmouth. Chewton, Hants, on Chamomile flowers; (*S. S. Saunders*). Norwich; (*Bridgman*). Lowestoft; (*Morice*).

C. marginata, *Smith* (*balteata* *Nyl.*, *Thoms.*)—Smaller than any of the preceding, ♂ with the ventral segments convex, punctured, their fasciæ entire, sixth without lateral depressions, armature with the sagittæ produced at each side into a curved wing, and a strong angular tooth nearer the base.

♀ with the thoracic hairs of a duller brown than in any of the preceding, clypeus and face less hairy; abdomen slightly shining, first segment largely and rugosely punctured, clothed with scattered pale hairs at the base, second with a wide basal band, composed of hairs of the ordinary type with short lateral branches, whereas the corresponding band in *fodiens* and *picistigma*, when present, is made up of short very thick somewhat scale-like hairs.

L. 8-9 mm.

July and August; Deal, on Dutch clover; Bembridge, Isle of Wight. Seaton; (*Bignell*). Littlehampton; Yorkshire; Cumberland; (*Smith*). Wallasey; (*Gardner*). Weybridge; (*Marshall*).

C. Daviesana, *Smith*.—Differs from all the preceding by the shining surface of the abdomen, and the much finer, sparser, puncturation of its basal segment. Otherwise in its

dull colour and small size it resembles *marginata*. Head and thorax somewhat remotely punctured; abdomen shining, basal segment clothed with long pale hairs, finely, and in the ♀ remotely, punctured, the following segments in both sexes still more finely punctured, each with an apical band of pale pubescence, second and following segments in the ♂ clothed with long black erect hairs, in the ♀ with shorter dusky hairs, sixth ventral segment in the ♂ with a strong blunt hairy tooth on each side, armature with the sagittæ very long, and resembling two concave knife blades, quite unlike those of the other species.

L. 8-9 mm.

Probably the commonest species of the genus; it occurs, like the others, in July and August, and is very partial to Chamomile flowers, *Senecio*, &c.; often forms large colonies in hard sandstone.

C. cunicularia, *Lin.*.—Almost twice as large as any of the preceding, black-brown, head and thorax densely clothed with dull brown hairs, those on the face of the ♂ paler, head very closely and rugosely punctured, thorax largely and remotely, antennæ in the ♂ reaching to about the scutellum, those of the ♀ shorter, abdomen clothed with erect, brownish hairs, each segment with a narrow, paler, apical fringe, subelliptic in the ♂, broadly ovate, its apex pointed in the ♀, more or less shining, its puncturation fine, more rugose and coarser in the ♂; armature of the ♂ with the sagittæ narrow, longer than the stipites; legs in the ♂ clothed with pale hairs, in the ♀ with brown hairs externally, with pale on their inner sides.

L. 14-15 mm.

Quite unlike the other species of the genus; could only be mistaken for an *Andrena* or a Hive Bee. It occurs at Wallasey; Southport; Waterloo Coursing Ground, near Liverpool; Crosby; Blackpool; Rock Ferry; Chester. It is a spring species, the females being taken at Sallow blossoms; this year, 1893, the male occurred as early as

March the 23rd, as recorded by Mr. Willoughby Gardner, Ent. Mo. Mag. xxix. p. 114.

PROSOPIS, Fab.

The British species of this genus are all small, black and nearly glabrous, with more or less yellow about the legs; the face of the male is yellow, except in *cornuta*, and that of the female usually with two yellow spots; tongue short and bifid, maxillary palpi six-jointed, labial palpi four-jointed, the joints cylindrical, paraglossæ obtuse; anterior wings with two submarginal cells; seventh and eighth ventral segments of the abdomen in the males much modified, and affording excellent specific characters; legs, with only short hairs, so that there is no appearance of any polliniferous apparatus, tibiæ without a patella: although these little bees are almost glabrous, what hairs they have, especially those round the prothoracic tubercles, are most beautifully pectinated; they generally form their nests in bramble stems, burrowing down the pith, occasionally, however, they utilize dock stems, or a hole in a wall, or in a post; their cells are lined with a semi-transparent membrane, and Smith says that they are provisioned with semi-liquid honey, but that Mr. Bridgman has observed that *P. hyalinatus* forms small pellets of honey and pollen. There are a great number of described species in this genus, but many are so obscure that it is very doubtful as to what proportion of them is really of value. The male abdominal characters are of primary importance, but being hidden are difficult to observe, and appear to have had little attention paid to them. F. Smith says that the genus occurs in both the Old and New World, and is well represented in Australia; there have also been several species described from the Sandwich Islands. From Great Britain there are eleven recorded species, which may be distinguished thus:—

- (2) 1. Face entirely black in both sexes, clypeus of the ♀ with two spine-like lateral projections CORNUTA.
- (1) 2. ♂, face white; ♀, face simple.
- (8) 3. Basal segment of abdomen with no lateral white pubescence at the apex.
- (7) 4. Scape of the antennæ in the ♂ dilated, flattened and white anteriorly; spots of the face in the ♀ nearly round, situated in the middle, just below the antennæ.
- (6) 5. ♂, mandibles white, and posterior tibiæ annulated with black at the apex; ♀, basal segment of abdomen almost impunctate, except a few fine punctures at the sides DILATATA.
- (5) 6. ♂, mandibles black, posterior tibiæ not ringed with black; ♀, basal segment of abdomen distinctly punctured on the disc MASONI.
- (4) 7. Scape of the antennæ in the ♂ not flattened and dilated; spots of the face in the ♀ on the margins of the eyes COMMUNIS.
- (3) 8. First abdominal segment with a narrow apical line of silvery pubescence on each side.
- (12) 9. Larger species; ♂ with the extreme base only of the hind metatarsi pale; ♀ with the basal segment of the abdomen largely and somewhat closely punctured.
- (11) 10. Face elongate; ♂ with the white colour extending laterally high above the insertion of the antennæ; mandibles streaked with white; ♀ with the lateral facial spots extending from near the base of the mandibles to above the antennæ. PUNCTULATISSIMA.
- (10) 11. Face shorter; ♂, white, colour not extending beyond the antennæ, mandibles black; ♀ with a short lateral spot, sometimes absent SIGNATA.
- (9) 12. Smaller species; ♂ with the posterior and intermediate metatarsi entirely pale, or nearly so; ♀ with the basal abdominal segment very finely or remotely punctured.
- (20) 13. Scape of the antennæ in the ♂ more or less swollen; facial spots in the ♀ subtriangular or linear, parallel to the inner margins of the eyes.
- (19) 14. Antennæ longer; scape of the ♂ less swollen, face hairy, or mandibles with a pale streak; ♀, pronotum generally with two yellow spots, vertex of head

- narrowed posteriorly, face subelongate.
- (16) 15. Face in ♂ hairy; mandibles black; ♀, flagellum of antennæ pale beneath . . . HYALINATA.
- (15) 16. Face in ♂ glabrous, mandibles with a white streak; flagellum in ♀ black beneath.
- (18) 17. Labrum in ♂ black; third ventral segment with a distinct central callosity; ♀, cheeks shorter, lateral facial spots smaller and narrower, basal segment of abdomen polished . . . CONFUSA.
- (17) 18. Labrum in ♂ white; third ventral segment simple; ♀, cheeks longer, facial spots larger and more widely-triangular, basal segment of abdomen microscopically rugose . . . GENALIS.
- (14) 19. Antennæ shorter; scape of the ♂ much swollen, face not hairy, mandibles black; ♀, pronotum entirely black, vertex of head quadrately produced posteriorly; face nearly round . . . BREVICORNIS.
- (13) 20. Scape of the antennæ in the ♂ not swollen, parallel-sided; ♀, face short and round, spots suboval, and placed diagonally . . . PICTIPES.

P. cornuta, *Smith*.—Black, head and thorax dull, closely punctured, clothed in the ♂ with short greyish-brown hairs, face in the ♂ convex, the antennæ pale yellow, the scape dilated, convex in front, black posteriorly and fringed with long pale hairs, the joints of the flagellum posteriorly with a black line, face behind the scapes of the antennæ with a shining excavation into which they fit; ♀ with the clypeus strongly reflexed at its lateral angles and produced into two angular teeth, which look like spines when viewed from above, antennæ simple, piceous beneath; tegulæ each with a yellow spot, wings slightly smoky, nervures testaceous, and the ♀ sometimes with two yellow spots on the collar, propodeum rugose at the base; abdomen shining, first and second segments rather strongly punctured, remainder more finely so, second, especially in the ♂, with a well-defined transverse impression, seventh ventral segment in this sex produced at the apex into two curved

lateral processes, dilated and truncate at the apex and two wing-like appendages on their proximal side, eighth narrowly produced, its apex terminating in two hairy processes, armature with the stipites truncate, and fringed with very long hairs; legs with the anterior tibiæ in front, the base of the other tibiæ and all the tarsi yellow in the ♂, the base of the tibiæ only yellow in the ♀, intermediate metatarsi in the ♂ much swollen at the base.

L. 6-7 mm.

Very rare; occurs in July and August. Reigate; Hollington, near Hastings; Cove Common, Hants; (*Smith*). Shire; (*Capron*). *Smith* says it has been bred from the stem of the common dock.

P. Masoni, *Saund.* (*dilatata Saund. nec Kirby*).—Black; head and thorax dull, deeply and closely punctured, ♂ with the face white, the mandibles black, the scape of the antennæ much flattened and dilated, deeply punctured, white, except along the stem of the joint, its posterior margin rounded and the anterior dilatation diverging from the stem above almost at right angles, then largely rounded and uniting again with the stem at its base at an angle of about 60°, its greatest width being across the centre, flagellum yellow, except along the back and at the extreme apex; ♀ with the antennæ simple, black, the flagellum fulvous beneath, face nearly round and bearing a roundish yellow spot just beneath each antenna; thorax with the tegulæ and tubercles and sometimes two spots on the pronotal collar yellow in both sexes, wings dusky; abdomen dull, strongly punctured in the ♂, shining in the ♀, with the basal segment distinctly but finely and rather remotely punctured, second segment in the ♂ with a distinctly impressed transverse line, beneath finely punctured, segments simple, seventh segment produced at the apex on each side into a transverse parallel-sided wing, eighth narrowly pointed, its apex clavate when viewed sideways, armature with the stipites narrowly rounded at

the apex, the sagittæ short and subtriangular; legs with the apices of the femora, the entire tibiæ and tarsi in the ♂, with the exception occasionally of a black spot inwardly, the base of the tibiæ only in the ♀, yellow.

L. 5-6 mm.

July and August; Hastings; Hayling Island, on *Hieraceum* and *Euphorbia*. Walmer, on *Achillea* abundantly.

I find I have been quite wrong in referring the above species, which I have taken freely in several localities, to *dilatata*, Kirb., of which I have carefully re-examined the type in the British Museum; I cannot find any described species with which it will agree, I have therefore named it in honour of Dr. Mason, of Burton-on-Trent, to whom I am greatly indebted for the loan of the specimens from Smith's collections, which have enabled me to verify the synonymy as regards the species described by him. This cannot be *Rinki* Gorski, as that species has the apices of the posterior tibiæ black and the antennæ with rings of a darker colour, and, according to Thomson, the third abdominal segment beneath transversely tuberculated.

P. dilatata, Kirb., *Smith (nec Saunders)*.—The ♂ of this species differs from that of *Masoni* in the absence of the dark apex of the antennæ, and in the shape of the scape, in which the anterior and posterior margins of the dilatation are subparallel, so that it is almost four-sided, the dilatation being produced upwards beyond the apex of the stem of the joint, instead of diverging from it at right angles; the front of the dilatation is pale, the colour widening above, the mandibles are yellow; the pronotal collar has two yellow spots, the mesonotum is narrower and not quite so closely punctured, the postscutellum is wider and the propodeum more coarsely clathrate; the abdomen is much more finely punctured, and rather more densely clothed with pale hairs, especially laterally at the apices of the segments, the edges of the segments slightly discoloured, beneath almost impunctate, fourth and fifth segments raised trans-

versely towards the apex; apex of posterior tibiæ, and a large spot on the inner margin of the intermediate tibiæ, black.

♀ exceedingly like that of *Masoni*, but with the basal segment of the abdomen almost impunctate, or only very finely punctured at the sides, and the apical segments more clothed with brownish white hairs.

L. 5-6 mm.

Barham; (*Kirby*). Pakefield, near Lowestoft, August, 1859, on flowers of the bramble; Blackwater, Hants; (*Smith*). Arundel; (*Stevens*). Bournemouth; (*Dale*). F. Smith, in his Cat. Brit. Hym. Brit. Mus. 2nd ed., says of the examples found by him at Pakefield: "I also observed it entering its burrows, which were excavated in stems of the common dock; the following summer I reared both sexes from these nests." These specimens I have seen and they are labelled "bred," so I feel certain that the ♀ here described is the correct one.

P. communis, *Nyl. (rupestris, Smith)*.—Black, head and thorax deeply punctured, clothed with short inconspicuous erect hairs, the surface between the punctures dull and finely aciculate, face in the ♂ slightly shining, clypeus down the centre only, or rarely entirely, and the sides of the face, yellow, the lateral spots somewhat encircling the antennal cavities, scape rarely with a yellow spot; ♀ with only an elongate triangular spot on each side of the face yellow, wings hyaline, scutellum more largely and remotely punctured than the mesoscutum, postscutellum subrugose, propodeum longitudinally rugose; abdomen shining, basal segment almost impunctate, without any apical white hairs at the sides, rest finely punctured, seventh ventral segment in the ♂ bilobate at the apex, the lobes concave and fringed with long hairs, eighth terminating in a narrow bifid process, armature with the stipites short and bluntly rounded, the sagittæ extending beyond them; ♂ with the anterior tibiæ in front, the posterior tibiæ at the base,

and the tarsi at their base more or less yellow; ♀ with the base of the posterior tibiæ only of that colour.

L. 6-7 mm.

Common and generally distributed, usually occurs on bramble flowers.

Rupestris, Smith, of which I have examined the type, is clearly referable to this species.

P. signata, *Panz.*.—Considerably larger than the preceding, black, head and thorax punctured, face, across the eyes, wider than long, white below the antennæ in the ♂, black in the ♀, generally with a narrow yellow spot on each side near the margin of the eye, scape of the antennæ in the ♂ slightly curved, thickened at the apex; pronotum with a spot on each side of the collar and the tubercles yellow, wings hyaline, propodeum finely and clathrately rugose; abdomen dull and strongly punctured in the ♂, shining and finely punctured in the ♀, both sexes with a lateral line of white pubescence at the apex of the basal segment, and with fine greyish hairs on the sides and towards the apex of the abdomen, ♂ with the seventh ventral segment produced at the apex into two triangular fringed lobes, eighth segment produced into a sharp apical point, armature with the stipites fringed with long hairs rounded at the apex, longer than the sagittæ; extreme base of the tibiæ and tarsi in the ♂ yellow.

L. 7-8 mm.

On flowers of bramble, mignonette, &c., July and August. Mr. V. R. Perkins has met with this species burrowing in hard clay banks, and also once found a colony breeding in the mortar of the stone wall of his garden.

P. punctulatissima, *Smith.*.—Very like *signata* but rather smaller, and easily distinguishable by its elongate face, which is longer than its width across the eyes; also by the colour of the face, which is yellower than in *signata*, in the ♂ this is produced high above the antennæ on each side, and in the ♀ lateral yellow spots border the

eyes from above the antennæ not quite to the base of the clypeus, the vertex of the head is also more incrassated, and narrower in proportion to the pronotal collar, which is unusually wide in this species; the wings are slightly dusky and the rugosities of the propodeum are coarser and shining; the puncturation of the abdomen is much larger and deeper, especially in the ♀, and its surface in that sex is less shining, ♂ with the seventh ventral segment terminating in two thin convex foliaceous lobes, under which are two similar smaller ones, eighth terminating in a bifurcate fringed process; armature unusually large, sub-depressed, stipites wide and transversely impressed across the middle, sub-truncate at the apex; sagittæ very long, as long as the stipites.

L. 6 mm.

Birch Wood; (*Smith*).

P. hyalinata, *Smith*.—Smaller than either of the preceding, black, shining; head and thorax very largely and coarsely punctured in the ♂, more finely in the ♀, face subelongate, very narrow between the eyes in the ♂, white below the antennæ, and clothed with white hairs, the colour extending slightly above their insertion on each side, in the ♀ black with two yellowish triangular lateral spots, in both sexes with the cheek between the eyes and the mandible unusually long, nearly as long as the basal width of each mandible, scape of the antennæ in the ♂ short and slightly swollen, the flagellum more or less pale beneath in both sexes; thorax clothed with short pale hairs especially laterally, tubercles in both sexes, and two spots on the collar in the ♀, pale, wings hyaline; abdomen with the basal segment very shining, largely and remotely punctured in the ♂, finely, very shallowly, and less remotely in the ♀, its apex bearing a lateral line of white hairs in both sexes, second and following segments in the ♂ less strongly and more closely punctured than the first, in the ♀ extremely finely punctured, apical segment in both

sexes with fine short grey hairs; ♂ with the seventh ventral segment produced into a triangular lobe at the apex, the eighth into a clear testaceous spoon-shaped process, just visible beyond the apical dorsal segment, armature with the stipites long and narrow, sagittæ very short; legs clothed with short silvery hairs, the base of all the tibiæ in both sexes, the anterior tibiæ in front, and all the tarsi in the ♂ white.

L. 6 mm.

A common species and generally distributed.

P. confusa, Nyl. (*punctulatissima*, Smith, Cat. Br. Hym. second Ed. ♂).—♂ rather larger and less shining than *hyalinata*, mandibles with a white line, face wider, not clothed with white hairs, antennæ entirely black, or with a narrow yellow line on the scape; thorax so finely and closely punctured as to appear dull, wings hyaline, propodeum finely and longitudinally rugose; basal segment of the abdomen finely and shallowly punctured, the following segments finely punctured, with grey pubescence at the sides, which almost forms lateral bands at the apices of the segments, third segment beneath with a distinct central callosity, seventh ventral segment with two subtriangular processes, the bases of which are produced laterally and subtruncate, eighth produced at the apex into a short narrow truncate process, armature with the stipites rounded at the apex, longer than the sagittæ, which are wide and subtriangular.

♀ differs from *hyalinata* in having the antennæ entirely black, the thorax wider across the middle and more closely punctured, though not so closely as in the ♂, the interstices dull, the wings slightly dusky; the second and following segments of the abdomen irregularly and vaguely punctured, whereas in *hyalinata* they are finely but distinctly so; the terminal segments are clothed with black hairs.

L. 6-7 mm.

Not nearly so common as *hyalinata*, but the ♀ is

probably often passed over for it, it occurs on bramble flowers from June to August.

Chobham; Woking; Hastings; Hayling Island; Southwold; Reigate. Wotton-under-Edge (*Perkins*). Land's End; (*Marquand*). Bickleigh; Horrabridge; (*Bignell*). Oxford; (*R. C. L. Perkins*). Lancashire; (*Gardner*). Norfolk; (*Bridgman*). Colchester; (*Harwood*). Ireland; (*Haliday*).

P. genalis, *Thoms.*—Differs from *confusa* Nyl. in being rather larger, and in having the face rather longer, the cheeks between the eyes and mandibles distinctly so.

The ♂ has also the labrum white, the third abdominal segment simple beneath, and the apex of the sixth ventral segment more truncate, the characters of the seventh and eighth ventral segments are not very pronounced, but the transverse portion of the seventh is narrower, and the hairs on the pointed apical processes longer and apparently more numerous, the apex of the eighth is more produced, and more widely truncate.

♀. This sex may be known from *confusus* by the longer cheeks, the larger, yellower, more widely triangularly facial spots, and the slightly, almost microscopically, more roughened surface of the basal abdominal segment.

L. 7 mm.

Three specimens on bramble flowers in Hollington Wood, near Hastings, in August, 1879.

P. brevicornis, *Nyl. (perforator, Smith)*.—Smaller than either of the preceding, black; head and thorax deeply punctured, the vertex of the former squarer than in the other species, especially in the ♀, face below the antennæ in the ♂, a spot on the inner side of each eye (often absent) in the ♀, white; the colour in the ♂ produced laterally above the antennal cavities, scape of the antennæ obconical and very swollen in the ♂, simple in the ♀; flagellum fulvous beneath in both sexes; thorax entirely black, wings dusky; abdomen dull and closely punctured

in the ♂, shining and very finely and remotely in the ♀; basal segment in both sexes with a very indistinct lateral line of silvery hairs at the apex, third ventral segment in the ♂ bituberculate in the centre, seventh produced at the apex into two very short blunt processes, eighth curved at the sides and apiculate, armature with the stipites rather pointed and hairy towards the apex, the sagittæ about equalling them in length; legs with the base of the posterior tibiæ in both sexes, and the front of the anterior tibiæ, and the basal joint of the intermediate and posterior tarsi in the ♂, white.

L. $4\frac{1}{2}$ – $5\frac{1}{2}$ mm.

Generally distributed in the South of England, but I have received no record of its capture in the North; like its congeners it frequents bramble flowers, &c.

P. pictipes, *Nyl.* (*varipes*, *Smith*).—About equal to *brevicornis* in size, but the ♂ is easily distinguished by the elongate face, which is much narrowed towards its apex, by the simple parallel-sided scape of the antennæ, which has often a narrow yellow streak in front, the yellow tubercles, the much less strongly punctured abdomen, the third segment of which is not tuberculated in the centre beneath, and by having all the tibiæ yellow at the base, and generally also in front; the seventh ventral segment is formed somewhat as in *punctulatissima*, the eighth terminates in a long process, which is bifid and hairy at its apices. The ♀ may be distinguished by the two oval yellow spots of the face, which are placed obliquely and do not border the eyes, and the yellow tubercles of the pronotum, also by the less incrassated vertex, and the narrower less dull mesonotum.

L. $4\frac{1}{2}$ – $5\frac{1}{2}$ mm.

Rarer than *brevicornis*, occurring in similar localities.

Chobham; Reigate; Bromley; Herne Bay; Hayling Island; Colchester, "burrowing in old posts; (*Harwood*). Sidmouth; (*R. C. L. Perkins*). Bristol; (*Thwaites*). Has-

tings; (*Frisby*). Near Manchester; (*Gardner*). Norfolk; (*Bridgman*).

ACUTILINGUES.

This is a very large section, in which the tongue varies from a short pointed and more or less cordate, to an elongate linear shape. The generic characters are chiefly drawn from the mouth parts; a good divisional character may be found in the form of the labial palpi, as given below.

The only exception is found in the genus *Rophites*, but its other characters are so like those of the *Andrenidæ* that I prefer to place it in that family.

- (2) 1. All the joints of the labial palpi cylindrical ANDRENIDÆ.
 (1) 2. Basal joints of the labial palpi sheath-like . APIDÆ.

ANDRENIDÆ.

In the family of *Andrenidæ* thus defined will be found a few genera, including *Nomada*, which have been considered by most authors as members of the *Apidæ*, but I feel little doubt that this is their proper position, although I know that in the case of *Nomada* I am taking a view in opposition to that of Prof. Perez of Bordeaux, whose knowledge of the Hymenoptera is far superior to mine. I base its position in the *Andrenidæ* on its general preference for species of that family as its hosts, on the depressed *andreniform* abdomen narrowly rounded at its base, the transverse labrum, and the cylindrical basal joints of the labial palpi. This combination of characters seems to me to remove it from the neighbourhood of *Megachile*, where Prof. Perez places it, although the ♂ armature would certainly favour that position, and to place it more naturally here than elsewhere, especially as, according to Packard, "the pupa differs from that of any other genus known to us except *Andrena* by having three conspicuous spines on the upper and posterior edge of the orbit." The other characteristics

of the *Andrenidæ* besides the form of the labial palpi are—the usually short ovate tongue, the transverse labrum, the ovate subdepressed abdomen with its anal orifice terminal in both sexes, and the densely hairy femora and tibiæ of the ♀ which serve as the polliniferous organs. This latter character is absent in *Sphecodes* and *Nomada*. Ten genera occur in Great Britain, which may be tabulated thus:—

(12)	1.	First joint of labial palpi not many times longer than the apical joint.	
(9)	2.	Anterior wings with three submarginal cells.	
(8)	3.	Apical joint of antennæ not obliquely truncate.	
(7)	4.	Lora absent, second and third joints of the antennæ subequal.	
(6)	5.	Sides of the tongue rounded to the apex, insects black or black and red, pronotum scarcely hairy; ♀ without tibial pollen brushes	SPHECODES.
(5)	6.	Sides of the tongue sinuate just before the apex, insects rarely red except occasionally in the ♂ sex, pronotum hairy, generally densely so; ♀ with well-defined pollen brushes.	HALICTUS.
(4)	7.	Lora present, third joint of antennæ twice as long as the second	ANDBENA.
(3)	8.	Apical joint of antennæ obliquely truncate.	CILISSA.
(2)	9.	Anterior wings with two submarginal cells.	
(11)	10.	Hind tibiæ and tarsi not dilated, clothed with very long hairs	DASYPODA.
(10)	11.	Hind tibiæ and tarsi dilated, not clothed with long hairs	MACROPIS.
(1)	12.	First joint of labial palpi many times longer than the apical joint.	
(18)	13.	Wings with two submarginal cells.	
(15)	14.	Marginal cells subtruncate, appendiculated	PANURGUS.
(14)	15.	Marginal cells pointed, not appendiculated.	
(17)	16.	Abdomen without pale pubescent bands	DUFOUREA.
(16)	17.	Abdomen with pale pubescent bands	ROPHITES.
(13)	18.	Wings with three submarginal cells	NOMADA.

SPHECODES, Latr.

The black and red colour of the species of this genus is their most striking characteristic, and although the males

of two or three species of *Halictus* are almost similarly banded with red, they are more hairy insects, and less shining. *Sphcodes* has the labrum longer than in *Halictus*, the rest of the mouth parts being almost identical with those of that genus; the membranous bag that invests the base of the cibarial apparatus is peculiarly developed, and its surface is clothed with transverse rows of very short bristly hairs, the sclerites of the hypopharynx are double on each side, and a strengthening sclerite passes from the base of the outer one diagonally down the side of the investing membrane; at the point where the sclerites of the hypopharynx unite with the membrane at the base of the maxillæ two or three bristly hairs appear, which probably represent the "scales" so clearly represented at the base of the maxillæ of the higher *Apilæ*; maxillæ rounded at the apex, palpi six-jointed, cardines very long, lora absent, their duties probably performed by two chitinized straps on the membrane which unites the cardines and which extends to just above the base of the submentum, with which they are connected by a membrane, submentum short and transparent, labial palpi with four cylindrical joints, tongue short, ovate, antennæ in the ♂ with the joints submoniliform in most of the species. Head and thorax black, sparsely pubescent, generally shining, the latter very largely punctured; wings with three submarginal cells, hooks on the anterior margin of the hind wing affording good divisional characters; abdomen subelongate in the ♂, subelliptic in the ♀, shining, generally black and red, rarely entirely black or red, ♂ armature very characteristic; tibiæ without a patella, spinose along the outer margin and sparsely hairy ♀, simple in the ♂ except in *spinulosus*, in which they have spines, somewhat as in the ♀.

The various species of this genus are very closely allied; the males can all be distinguished for certain by reference to the form of the armature, but the females of some of the small species are exceedingly difficult to make out. The

number of alar hooks, the form of the sixth dorsal valve and the general puncturation are the chief distinguishing characteristics. They frequent similar localities to *Halictus*, and the question as to whether they are inquilines on the latter genus is still to a certain extent an open one. The direct evidence in favour of it rests on many observations that certain *Sphcodes* are always found with certain *Halicti*, and are not found in localities where these *Halicti* are absent. The evidence against it rests on the fact that *Sphcodes* has more than once been seen making a burrow for itself. Mr. R. C. L. Perkins's observations on these points (E. M. M. xxv. p. 207) seem to me to go a long way towards establishing the former of these positions, which I think is strengthened by the very strong structural similarity of the two genera and the exact similarity of their habits, which are unlike those of any other solitary bees; the ♀ passes the winter in an impregnated state, and in the spring emerges and makes her cells and lays her eggs; about July or August the new males begin to emerge, and the new females follow them in about a week or fortnight; after this the males may be found plentifully about flowers, &c., and the majority of the females, after impregnation, burrow, or at any rate stay near their burrows, and wait for warm spring weather to wake them up to work again. There are at present fifteen known British species, but this number may be yet increased, and the number of European species is probably still quite uncertain. Like *Halictus*, it is found all over the world. It is essential for the correct determination of these insects to extract the genital armature of the ♂, so that it shall be visible beyond the apex of the abdominal segments, and also to draw out the apex of the abdomen in the ♀, so that the glabrous area of its apical dorsal valve can be fully examined. Specimens not so prepared are sometimes quite impossible to name.

- (8) 1. Larger species, posterior wings with
7-10 hooks.

- (7) 2. ♂, posterior tibiæ not spinose; ♀, mesonotum very shining, its puncturation large and remote.
- (4) 3. ♂, basal pubescent bands of antennæ reaching about one-third up each joint, widened at the sides; ♀, glabrous centre of apical dorsal valve very narrow, almost linear. GIBBUS.
- (3) 4. ♂, basal pubescent bands of antennæ very narrow, not widened at the sides; ♀, glabrous centre of apical dorsal valve more or less wide.
- (6) 5. ♂, lacinia of armature not bifid at the apex, second submarginal cell very narrow; ♀, sides of propodeum reticulated, spines along the edge of the tibiæ black RETICULATUS.
- (5) 6. ♂, lacinia of armature bifid, second submarginal cell not very narrow; ♀, sides of propodeum strigose, apex of dorsal valve wide and flat; spines of posterior tibiæ pale SUBQUADRATUS.
- (2) 7. ♂, posterior tibiæ with pale marginal spines as in the ♀; ♀, mesonotum dull, closely and rugosely punctured SPINULOSUS.
- (1) 8. Larger or smaller species, posterior wings with 5-6 hooks.
- (18) 9. ♂, stipites of armature simple, not grooved at the base; ♀, dorsal valve wide, flat, and dull; or mandibles not toothed; or very small, the labrum ferruginous.
- (15) 10. ♂, stipites not longitudinally strigose; finely rugose or nearly smooth; ♀, mesonotum finely punctured, apical dorsal valve not dull and punctured.
- (14) 11. Second submarginal cell wide in both sexes; ♂, genital armature longer than wide; ♀, mandibles not toothed.
- (13) 12. ♂, lacinia of armature not fringed with hairs at the apex, its membrane produced along the inner edge of the stipes; ♀, larger and darker, apical dorsal valve narrowly rounded at the apex, and with an impressed marginal line PUNCTICEPS.
- (12) 13. ♂, lacinia fringed with hairs, its membrane not produced, abdomen entirely black or piceous; ♀, smaller, lighter, apical valve widely rounded at the apex, its margins reflexed LONGULUS.

- (11) 14. Second submarginal cell narrow in both sexes; ♂, entirely black, armature nearly twice as wide as long; ♀, mandibles toothed . . . NIGER.
- (16) 15. ♂, stipites distinctly strigose; ♀, mesonotum closely and rather largely punctured; apical dorsal valve wide, flat and punctured.
- (17) 16. Larger; abdomen of the ♂ elongate, lacinia of armature flat and submembranous, its apex clothed with long hairs; ♀, dorsal apical valve only slightly reflexed at the edges . . . FILIFRONS.
- (16) 17. Smaller; abdomen of ♂ short, lacinia of armature bifid at the apex; ♀, dorsal valve distinctly margined . . . SIMILIS.
- (9) 18. Stipites of ♂ armature widely grooved at the base; ♀, mandibles toothed; or glabrous area of dorsal valve narrow and shining, labrum black.
- (22) 19. ♂, basal segment of abdomen red, or mostly so; basal pubescent bands of antennæ narrow; ♀, anterior tibiæ black in front.
- (21) 20. Larger; ♂, anterior tibiæ black in front; ♀, second segment of abdomen distinctly punctured at the base . . . FERRUGINATUS.
- (20) 21. Smaller; ♂, anterior tibiæ pale in front; ♀, second segment of abdomen with only very superficial punctures at the base . . . HYALINATUS.
- (19) 22. ♂, basal segment of abdomen black except at the extreme apex, antennæ either with or without basal rings of pubescence; ♀, anterior tibiæ pale in front.
- (24) 23. ♂, antennal joints ringed with pubescence at the base; ♀, vertex of head rather quadrate, puncturation of mesonotum very fine and scattered . . . VARIEGATUS.
- (23) 24. ♂, antennal joints without basal rings, the pubescence reaching nearly to the apex; ♀, vertex of head less quadrate, puncturation of mesonotum fine or coarse.
- (26) 25. ♂, thick portion of the lacinia dilated at the apex on its inner margin; ♀, mesonotum not very shining, largely punctured . . . DIMIDIATUS.
- (25) 26. ♂ apex of lacinia not widely dilated on its inner margin; ♀, mesonotum very

shining, its puncturation very fine
and remote AFFINIS.

S. gibbus, *Linn.*.—Black, shining, second, third, and fourth segments of the abdomen more or less red in the ♂, first, second, and third in the ♀.

♂ with the antennæ very long and thick, third joint of the flagellum many times longer than the transverse second joint, pubescent bands at the base of the joints produced along the sides towards the apex; mesonotum largely and rugosely punctured, wings slightly dusky, second submarginal cell not quite so wide at the base as long; abdomen rather strongly punctured, variable in the extent of its black colour, armature with each lacinia produced into two fringed processes, the upper one very elongate, narrow, and curved, the lower one short and concave.

♀ with the mesonotum very shining, very largely and remotely punctured, propodeum rugosely strigose at the sides; wings darker than in any of the other species, with a distinct apical band, second submarginal cell shaped much as in the ♂; abdomen shining, indistinctly punctured, glabrous, centre of apical dorsal valve very narrow, hairs and spines along the external margin of the posterior tibiæ black.

L. 8–10 mm.

Probably our commonest species, and generally distributed.

S. reticulatus, *Thoms.*.—Like a rather small *gibbus* but the puncturation of the mesonotum less coarse.

♂ with the antennæ less elongate and thinner than in *gibbus*, joints of the flagellum with the basal pubescent bands much narrower, anterior wings with the second submarginal cell very narrow, its sides subparallel, about twice as long as wide; abdomen shining, less strongly punctured, armature with the lacinia elongate and rather thick, with a membranous wing along the inner margin.

♀ differs from *gibbus* in the narrow second submarginal

cell, the less smoky wings, the reticulated (not strigose) sides of the propodeum, the wider glabrous area of the dorsal valve of the abdomen, and the much more finely punctured, grey pubescent fourth segment; the black of the apex also does not extend on to the third segment, as is usually the case in *gibbus*.

L. 7-9 mm.

Woking and Chobham, rare. I know of no other localities. I am inclined to think that it associates with *Halictus prasinus*, Sm.

S. subquadratus, *Smith*.—Like the preceding in colour, but rather larger, both sexes may be distinguished by the wider second submarginal cell; the ♂ may be further known by the short bifid lacinia of the armature, and the ♀ by the incrassate vertex, the strigose sides of the propodeum, the wide flat glabrous area of the dorsal valve, and the pale tibial spines.

L. 8-10 mm.

Very common and generally distributed.

S. spinulosus, *v. Hag*.—♂ larger than any of the preceding and its antennæ shorter, the third joint of the flagellum scarcely longer than the first and second together; mesonotum closely punctured and clothed with grey hairs, wings with the second submarginal as wide at the base as long, alar hooks ten; abdomen coarsely punctured, wider than in any of the preceding, armature with the lacinia short and simply pointed with a membranous wing produced along the inner margin of the stipes, tibiæ with fine pale spines on their outer edge.

♀ with the mesonotum closely punctured, clothed with short grey hairs, alar hooks 9-10, wings dark smoky brown; abdomen with the first three segments entirely and the sides of the fourth, red, glabrous area of dorsal valve narrowed to the apex.

L. 11-12 mm.

Rare. Gloucestershire; (*V. R. Perkins*). Wiltshire, in

company with *Halictus xanthopus*; (*R. C. L. Perkins*). There seems to be little doubt that this species is associated with *H. xanthopus*. Ireland; (*Haliday*). Cowbridge, Devon; (*J. C. Dale*). I doubt if the ♀ I recorded from Littlehampton belongs to this species.

S. puncticeps, *Thoms.*—Smaller than any of the preceding, ♂ with the basal rings of the antennal joints reaching to about a third of their length, vertex closely punctured; mesonotum shining, rather remotely and strongly punctured, wings with the second submarginal cell as wide at the base as high, slightly narrowed towards the apex, sides of the propodeum strongly rugose; abdomen either entirely black, or with the first, second, and third segments more or less red, armature orange red in colour, the stipites finely rugulose, not strigose, the lacinia simply triangular and submembranous.

♀ rather more brightly coloured than in most of the species; mandibles long, pointed, untoothed; mesonotum shining, distinctly and rather strongly punctured, wings as in the ♂; abdomen with the fourth and following segments black, the apex of the third more or less clouded, glabrous area of dorsal valve narrow, punctured, with a rather deeply impressed marginal line, legs entirely black.

L. 6-7 mm.

Rare. Woking; Chobham; Bournemouth. Sidmouth; (*R. C. L. Perkins*). Lowestoft; (*Morice*). Gloucestershire; (*V. R. Perkins*).

S. longulus, *v. Hay.*—Very like *puncticeps* but smaller and narrower, being one of the smallest of the genus.

♂ entirely black or piceous, differing from *puncticeps* in the pubescent bands of the antennæ, which extend to nearly half the length of each joint, and in the fringed lacinia, the membrane of which is not produced along the inner edge of the stipes; from *niger*, the only other species it could be mistaken for, the shape of the armature and the wider

second submarginal cell with its more contracted apex will distinguish it at once.

♀ smaller and paler than *puncticeps*, the legs paler, and the area of the apical dorsal valve widely rounded at the apex.

L. 5-5½ mm.

Rare. Woking; Chobham; I have received no other localities.

S. niger, *v. Hag.*—About the same size as *longulus*; ♂ entirely black, armature dark brown, very short, and transverse, the stipites scarcely strigose, laciniae very short, narrow, and concave; second submarginal cell narrow, subparallel-sided.

♀ second submarginal cell as in the ♂, face much raised just below the insertion of the antennae, labrum pale, mandibles toothed, abdomen very convex and short, with the basal segment entirely pale, the rest more or less clouded with black.

L. 5-5½ mm.

Guestling, near Hastings; (*Rev. E. N. Bloomfield*).

S. pilifrons, *Thoms.*—A large species, about the size of *gibbus*, &c., alar hooks 5-6 in number.

♂ vertex clothed with grey, face densely clothed with white hairs, antennae short, the third joint of the flagellum about as long as the first and second together, the pubescent rings of the joints reaching to about a third of their length; mesonotum rather wide, closely punctured, and clothed with grey hairs, wings hyaline, second submarginal cell wide; abdomen very shining, red, first segment black at the base, first and second scarcely punctured, fourth and following black, armature with the lacinia subquadrate and submembranous, thickened in a curved line across the centre, its apical margin fringed with long hairs.

♀ very like *gibbus*, &c., but easily recognized by the closely punctured, grey pubescent mesonotum, the number of the alar hooks, and the wide, flat, punctured area of the

apical dorsal valve, third abdominal segment finely and closely punctured at the base; spines of the tibiæ pale.

L. 9-10 mm.

Woking; Chobham; Tunbridge Wells; Hampstead; Worthing; Hastings. Bury St. Edmunds; (*Tuck*). Colchester; (*Harwood*). Dorsetshire; (*Dale*). Gloucestershire; (*Perkins*). Maidstone; (*Frisby*). Lancashire; (*Gardner*). Rugby; (*Morice*).

S. similis, *Wesm.*—♂ distinguishable easily from *pili-frons* by its smaller, shorter form, the more swollen joints of the flagellum, the narrow second submarginal cell, and the concave lacinia of the armature; as a rule all the abdominal segments are spotted with black.

♀ scarcely distinguishable from that of *pili-frons*, but as a rule smaller, with the anterior tibiæ pale in front, the third abdominal segment coarsely and remotely punctured at the base, and with the area of the dorsal valve rather narrower, and with a distinct marginal impression. I have looked in vain for more satisfactory characters.

L. 6-8 mm.

Woking; Chobham; Reigate; Littlehampton; Worthing; Southwold; Canterbury; Bromley; Hastings. Colchester; (*Harwood*). Dorsetshire; (*Dale*). Gloucestershire; (*Perkins*). Maidstone; (*Frisby*).

S. ferruginatus, *Schenck.*—♂ differing from any of the preceding in the deep groove at the base of the stipites of the armature, it is very variable in colour and size, some large examples being almost as wide in the abdomen as the ♀, and similarly coloured, others much narrower and smaller, with all the abdominal segments banded with black, the basal segment however is always more or less red; the mesonotum is very finely and closely punctured, joints of the flagellum with narrow basal pubescent bands, genital armature with the lacinia straight along its external margin, which is slightly thickened at the apex, which bears a few long hairs, and with a triangular membrane on its inner

margin extending along and beneath the inner margin of the stipes, stipes widely grooved at the base to about half its length.

♀ with the mesonotum shining, finely but more sparsely punctured than in the ♂, alar hooks 6, area of dorsal valve shining, testaceous, its centre raised, second and third abdominal segments finely and clearly punctured at the base, third without black lateral foveæ.

L. 6-7 mm.

Wotton-under-Edge; (*V. R. Perkins*). Sidmouth; Oxford; (*R. C. L. Perkins*). Colchester; (*Harwood*). Rugby; (*Morice*). Scotland; (*Service*).

S. hyalinatus, *Schenck*.—Very like the preceding, but smaller.

♂ differing in the paler red of the markings, the pale colour of the anterior tibiæ in front, and the form of the lacinia which are broader at the base than in *ferruginatus*, so that their thickened portion is more or less triangular.

♀ like a small *ferruginatus*, but with the base of the second abdominal segment very shallowly and indefinitely punctured, third segment rarely with a lateral fovea.

L. 5-6 mm.

Wotton-under-Edge; (*V. R. Perkins*). Sidmouth; Oxford; (*R. C. L. Perkins*).

S. variegatus, *v. Hag.* (*var. divisus v. Hag.?*).—♂, antennæ with a narrow pubescent band at the base of each of the joints of the flagellum; mesonotum finely but not very closely punctured, wings with the second submarginal cell sometimes exceedingly narrow, (*divisus v. Hag.*); all the segments of the abdomen banded with black, armature with the groove of the stipes almost extending to the apex; anterior tibiæ pale in front.

♀ very difficult to determine with certainty, as it resembles that of *affinis* most closely; it may be known from any other by the very shining mesonotum, which is very finely and remotely punctured, and the anteriorly pale front

tibiæ, from *affinis*, its slightly larger size, more incrassated vertex, and more distinct dorsal line of the mesonotum will help to distinguish it.

L. 6 mm.

I have united *divisus* v. Hag. to this, as I do not feel that there is character enough to distinguish it specifically even in the ♂.

Woking; Chobham; Herne Bay; Hastings. Seaford; (*Ramsden*). Scotland; (*Service*). Wotton-under-Edge; (*F. R. Perkins*). Sidmouth; (*R. C. L. Perkins*). Rugby; (*Morice*). Colchester; (*Harwood*).

S. dimidiatus, v. Hag.—♂, small and narrow, easily distinguished from all but the following species by the form of the antennæ joints, which have their faces flattened and pubescent almost to the apex of each, from *affinis* the dilated apex of the thickened portion of the lacinia will distinguish it easily.

♀, this sex may be known by the more largely and closely punctured mesonotum, which has a rather deeply impressed dorsal line in front.

L. 5-6 mm.

Common, and probably generally distributed.

S. affinis, v. Hag.—♂ with the lacinia slightly widened, and produced on to its membrane near the middle, being narrowed again to the apex.

♀ with the mesonotum very smooth and shining, the puncturation very fine and remote.

L. 5-6 mm.

Common, and like the last probably generally distributed. I have received it from Scotland and Ireland.

HALICTUS, Latr.

An extensive genus, and amongst the most difficult as regards the discrimination of its species. Structurally it very

closely resembles *Sphecodes*, and except for the form of its tongue, which has the sides slightly sinuate, and the more transverse labrum, the description of the mouth parts of *Sphecodes* will apply equally well to this genus. The antennæ in the ♂ are long as in *Sphecodes*, but the joints are simple, not moniliform, those of the ♀ are short and simple. The ♂ is nearly always narrow and elongate in form, with cylindrical abdomen, the ♀ much wider and more robust, six ventral segments are exposed in the ♂, five in the ♀, the fifth dorsal segment in the latter sex bears a longitudinal ridge or *rima*, the sixth being almost hidden beneath the fifth; these characters of the fifth and sixth segments are peculiar to this genus, so far as the British fauna is concerned. The form of the armature of the ♂ is often very valuable as a help in determining the species, although it is not of such value as in *Sphecodes*, and in some species is scarcely characteristic; the armatures of all the British species are figured in Trans. Ent. Soc. 1882, pl. 8-9. The most important characters seem to lie in the shape of the face and propodeum, and the sculpture and puncturation of the different parts of the insect; in some species there is a row of fine spines along the underside of intermediate femora, and the calcaria in some are beautifully serrate; the polliniferous hairs are borne on the tibiæ, which in the ♀ are also furnished with a patella at the base, and the underside of the femora, coxæ, and trochanters. The various species burrow in banks or sandy places, or even sometimes in hard footpaths, often forming large colonies, their burrows are branched; in times of appearance, &c., they resemble *Sphecodes*. Mr. R. C. L. Perkins has given a great deal of attention to their habits, and has studied their burrows, &c., with great care; he is convinced that the new females retire at once to their burrows after impregnation, which he thinks often takes place in the burrow itself, and that only a few stragglers are found at any distance from them, the males

resorting to flowers, &c., till they die ; this accounts for the very small proportion of females which appear in the autumn. In and round the burrows Mr. Perkins says they are abundant, and probably, if anything, outnumber the males. According to Smith, several *Nomadæ* are parasitic on the species of this genus, but as Mr. R. C. L. Perkins remarks, these inquilines appear in July and August, when the *Halicti* are hatching out, and as the new ♀ *Halicti* hibernate like *Bombus*, &c., in the impregnated state and make no cells till the spring, it seems clear that it would be useless for the *Nomadæ* to lay their eggs in the foodless burrows. I have never personally taken any species of *Nomada* with *Halictus*, and I strongly suspect that there has been some error of observation.

Some of the species are attacked by one of the *Stylopidae*, *Halictophagus*, which lives in the body of the bee, the head protruding as a rule between the segments of the abdomen.

From the difficulty of the subject the following table is very imperfect, but anyone who knows how closely allied some of the species are will appreciate the difficulties which have had to be contended with. Nearly all the species frequent yellow composites such as *Crepis*, &c., although they do not all confine themselves to such.

- | | | | |
|------|----|--|----------------|
| (50) | 1. | Species not bronzy. | |
| (7) | 2. | Apices of the abdominal segments with white pubescent bands or spots. | |
| (6) | 3. | Abdominal bands entire, or nearly so. | |
| (5) | 4. | ♂, mandibles simple; ♀, posterior tibiæ clear testaceous . . . | RUBICUNDUS. |
| (4) | 5. | ♂, mandibles dilated at the base beneath; ♀, posterior tibiæ black . . . | QUADRICINCTUS. |
| (3) | 6. | Abdominal segments with only a lateral white spot . . . | MACULATUS. |
| (2) | 7. | Pubescent bands or spots when present situated at the base of the segments, their apices unbanded. | |
| (21) | 8. | Large or medium sized species, abdomen deep black, with conspicu- | |

- ous pubescent spots or bands on the second, third, and sometimes fourth segments, posterior margins of segments not testaceous.
- (10) 9. Tibiæ pale in both sexes. XANTHOPUS.
 (9) 10. Tibiæ dark in both sexes.
 (20) 11. No greenish tinge on the head and thorax.
 (13) 12. Pubescence of thorax ashy grey SEXNOTATUS.
 (12) 13. Pubescence of thorax more or less brown.
 (15) 14. ♂, abdomen beneath without long hairs; abdominal bands of ♀ more or less fulvous LEVIGATUS.
 (14) 15. ♂, abdomen beneath clothed with long hairs; ♀, abdominal bands white.
 (19) 16. Tarsi of ♂ entirely black, or white only on the basal joint above; abdominal bands in the ♀ entire or nearly so.
 (18) 17. Tarsi of ♂ with the basal joint pale; ♀ with the basal abdominal segment finely and closely punctured all over LEUCOZONIUS.
 (17) 18. Tarsi of ♂ entirely black; ♀ with the disc of the basal segment shining and remotely punctured ZONULUS.
 (16) 19. Tarsi of ♂ entirely yellowish; abdominal segments in the ♀ with only a white lateral spot QUADRINOTATUS.
 (11) 20. Head and thorax more or less greenish PRASINUS.
 (8) 21. Large or medium sized species with pale apical margins to the segments; or small species with scarcely any indication of lateral spots, or with the body entirely black.
 (33) 22. ♂, abdomen smooth and glabrous beneath; ♀, brow of propodeum sharply truncate, or at least with a more or less raised transverse line at the sides.
 (32) 23. Abdomen more or less punctured in both sexes; antennæ in the ♂ not reaching to the third abdominal segment.
 (29) 24. First abdominal segment scarcely punctured, the punctures fine and remote.
 (28) 25. Large or medium sized species, 10-12 mm., mesonotum very closely punctured.

- (27) 26. Larger, ♂ with the propodeal area semi-circularly defined by a raised line; ♀ with the propodeum posteriorly sharply truncate, the angles of the truncature sharply rectangular, and enclosed by a reflexed margin CILINDRICUS.
- (26) 27. Smaller, ♂ with the propodeal area not enclosed by a raised line; ♀ with the propodeum less sharply truncate, the angles less distinct, and less strongly margined, especially at the sides ALBIPES.
- (25) 28. Small, 6-7 mm., mesonotum rather remotely punctured PAUXILLUS.
- (24) 29. First abdominal segment very finely and closely punctured.
- (31) 30. Larger, propodeum with a distinct ridge just below its brow, basal segment of abdomen in both sexes exceedingly finely, and closely punctured MALACHURUS.
- (30) 31. Smaller, propodeum without a distinct ridge, basal segment of abdomen less closely punctured LONGULUS.
- (23) 32. ♂ with the antennæ reaching to the third abdominal segment; ♀ abdomen impunctate or nearly so SUBFASCIATUS.
- (22) 33. ♂, abdominal segments fringed beneath; ♀, brow of propodeum rounded, smoother than its rugose base, no raised lateral ridge.
- (15) 34. ♂, tarsi pale, or face much longer than wide; ♀, with the basal segment of the abdomen punctured, or if not punctured, mesonotum remotely or coarsely punctured.
- (36) 35. ♂, antennæ entirely black; ♀, mesonotum very largely and coarsely punctured PUNCTICOLLIS.
- (35) 36. ♂, antennæ pale beneath; ♀, mesonotum not very coarsely punctured.
- (40) 37. Mesonotum very shining, remotely punctured; ♂, labrum and mandibles black.
- (39) 38. Abdomen impunctate LEVIS.
- (38) 39. Abdomen with the second and following segments closely punctured VILLOSLUS.
- (37) 40. Mesonotum not very shining, more or less closely punctured; ♂, labrum and generally mandibles, pale.

- (44) 41. Face across the eyes not longer than wide.
- 43) 42. ♂, abdomen short, without ventral tufts of pubescence; ♀, face broader than long BREVICEPS.
- 42) 43. ♂, abdomen elongate, segments beneath with long lateral tufts of white hairs; ♀, face not broader than long NITIDIUSCULUS.
- (41) 44. Face decidedly longer than wide across the eyes PUNCTATISSIMUS.
- (34) 45. ♂, tarsi black, or rarely testaceous in *atricornis*; ♀, basal segment of abdomen impunctate, mesonotum finely and closely punctured.
- (19) 46. ♂, basal segment of abdomen not strongly punctured; ♀, mesonotum without a deeply impressed dorsal line.
- (18) 47. Rather larger, face longer and clypeus more produced in both sexes; abdomen in the ♀ more convex ATRICORNIS.
- (17) 48. Rather smaller, face shorter, and clypeus less produced, abdomen in the ♀ less convex MINUTUS.
- (16) 49. ♂, basal segment of abdomen strongly punctured; ♀, mesonotum with a deeply impressed dorsal line MINUTISSIMUS.
- (1) 50. Species more or less bronzy.
- (54) 51. Tibiæ and tarsi of ♂ flavous; ♀, abdomen densely hairy, with pale pubescent apical bands.
- (53) 52. Hairs of the mesonotum in ♀ fulvous, pubescence of head and thorax very dense; ♂, antennæ not nearly so long as the entire insect GRAMINEUS.
- (52) 53. Hairs of mesonotum in ♀ whitish, pubescence of head and thorax not so dense; antennæ in the ♂ as long as the entire insect TUMULORUM.
- (51) 54. Tibiæ of ♂ not flavous, ♀, abdomen not densely hairy, without apical bands.
- (56) 55. Abdomen with a bright bronzy or greenish tinge SMEATHMANELLUS.
- (55) 56. Abdomen black or nearly so.
- (58) 57. ♂, tarsi black; face subelongate in ♀ MORIO.
- (57) 58. ♂, tarsi pale; face nearly round in ♀ LEUCOPUS.

H. rubicundus, *Christ.*—Black, head and thorax closely punctured, densely clothed with bright brown hairs, fading to grey after exposure, mandibles simple, apex of the clypeus white in the ♂, antennæ in that sex reaching to about the scutellum, slightly brownish beneath; wings nearly hyaline, with a slight apical cloud, propodeum with its basal area enclosed by a slight elevation, finely rugose, the rugosities stronger in the ♂, and at the extreme base; abdomen elongate ♂, subelliptic ♀, very finely punctured, clothed with scattered pale hairs, each segment with a narrow apical band of white pubescence, fifth segment in the ♀ clothed with bright golden hairs except on the central rima; ♂ with the fourth and fifth ventral segments emarginate, armature with the lacinia slightly curved, densely fringed with hairs on the inner margin; legs with the femora black in both sexes, ♂ with the tibiæ and tarsi flavous, except a dark spot on the inner side of the former; ♀ with all the tarsi, the posterior, and the apex of the intermediate tibiæ, clear testaceous, the posterior femora beneath, and the tibiæ entirely, clothed with shining golden hairs.

L. 10 mm.

Common, and generally distributed.

The clear yellow posterior tibiæ of the ♀, the simple mandibles and entire abdominal bands of the ♂, distinguish this from our other apically banded species.

H. quadricinctus, *Fab.*—Rather duller and more largely punctured than the preceding; head and thorax clothed with dull, greyish-brown hairs, ♂ with the face elongate, the mandibles dilated at the base beneath, clypeus much produced, yellow at the apex, antennæ reaching to the brow of the propodeum, almost entirely testaceous; wings nearly hyaline; abdomen in both sexes with the apical white bands of the first and second segments interrupted, the rest entire, fifth segment in the ♀ clothed with pale silvery golden hairs, ♂ with the fourth and fifth

ventral segments impressed, emarginate at the apex and fringed with short golden hairs, armature with the lacinia elongate, somewhat twisted, subparallel-sided, with two long apical tufts of hairs; legs in the ♂ with the apices of the femora, the anterior and intermediate pair in front, and all the tibiæ and tarsi flavous, the posterior tarsi with a black spot on each side, legs in the ♀ entirely black, except the tarsi towards the apex, posterior tibiæ clothed with pale golden hairs.

L. 9 mm.

Very rare. London District; Blakenham Parvum; (*Kirby*). Isle of Portland; (*Dale*). On the Brighton Downs, near Falmer; (*S. S. Saunders*). Seaford; (*Ramsden*).

H. maculatus, *Smith*.—Black; ♂ dull, ♀ shining; head closely punctured, its vertex subquadrate, wider than the thorax in both sexes, face in the ♂ densely clothed with white hairs, clypeus with a white apical spot, mandibles simple, and the antennæ in that sex reaching to about the scutellum, brown beneath; mesonotum shining, less closely punctured than the head, with a scattered pale pubescence, wings smoky, basal area of propodeum finely rugose; abdomen closely punctured in the ♂, finely and more remotely in the ♀, ♂ with a narrow line, ♀ with a spot, of silvery white hairs on the sides of the apex of the first four segments, abdomen in the ♀ narrower and more parallel-sided than usual in this sex, its fifth segment with pale golden hairs on each side of the rima, ♂ with the ventral segments flat, fourth and fifth not emarginate at the apex, surface punctured, nearly glabrous, armature with the lacinia narrow and parallel-sided, fringed with hairs along the inner margin, ♀ beneath densely clothed with golden hairs; ♂ with the front tibiæ anteriorly, intermediate and posterior tibiæ at the base and apex, and all the tarsi yellow, ♀ with the legs black, scopæ pale golden.

L. 9 mm.

Hastings, August, 1879. Weybridge; Blackwater, Hants; (*Smith*). A single ♀ was captured in each case. I have described the ♂ from a Continental specimen.

H. xanthopus, *Kirby*.—Large, black; head very finely and closely punctured, face clothed with pale hairs in the ♂, with bright brown in the ♀, antennæ in the ♂ black, reaching to the propodeum and clypeus with a pale spot; thorax rather strongly punctured in the ♂, very finely and closely in the ♀, densely clothed with bright brown, or, when faded, greyish brown hairs, especially on the pleuræ, wings very slightly clouded, nervures testaceous, propodeal area finely and longitudinally rugose; abdomen wide and subelliptic in both sexes, finely punctured, the apices of the segments in the ♀ exceedingly finely and closely so, basal segment with golden hairs at the sides, second, third, and fourth segments each with a lateral band-like spot of white pubescence at the base, fifth segment in the ♀ clothed with golden hairs on each side of the central rima; ♂ with the fifth segment beneath emarginate, armature with the cardo very large and subquadrate, the lacinia narrow and much curled inwards; abdomen of the ♀ beneath, densely clothed with long golden hairs; legs densely clothed with golden hairs, posterior tibiae and posterior and intermediate tarsi clear testaceous in both sexes, inner calcar of posterior tibiae in the ♀ strongly serrate.

L. 12–13 mm.

Hastings. Brighton; Ventnor; Arundel; Littlehampton; Kingsdown; Southend; (*Smith*). Shire; (*Capron*). Dartford; (*R. C. L. Perkins*). Exeter; (*Parfitt*). Gloucestershire (*V. R. Perkins*). Portland; Blandford; Lizard; Weymouth; (*Dale*). Maidstone; Burford Bridge, Surrey; (*Marshall*). Tring; (*Piffard*).

H. leucozonius, *Schrank*.—Black; ♂ much smaller than ♀; head very finely and closely punctured, clothed with pale hairs, ♂ with the face below the antennæ with

white hairs, the antennæ short, reaching only to about the insertion of the wings, clypeus with a white spot; thorax clothed with pale greyish brown hairs, mesonotum rather strongly and closely punctured, wings nearly hyaline, postscutellum in the ♀ densely villose, propodeum truncate, its basal area triangular and longitudinally rugose, clathrate beyond it; abdomen closely and finely punctured, especially in the ♀, which has the basal segment finely and closely punctured all over; second, third and fourth segments in both sexes with a white basal band, narrowed in the centre in the ♂, fifth segment in the ♀ clothed with golden hairs on each side of the rima, beneath in both sexes densely clothed with pale hairs, ♂ armature with the laciniae narrow and simply curved at the apex; legs black, clothed with greyish hairs in the ♂, golden in the ♀, intermediate and posterior metatarsi in the ♂ pale at the base.

L. 8-10 mm.

Common and generally distributed.

H. zonulus, *Smith*.—♂ and ♀ of nearly equal size, ♂ easily known from that of the preceding by its larger broader form, large quadrate head, its wide abdomen almost as wide as that of the ♀, its nearly vertical seventh dorsal segment, with the apex truncate, the curious tuft of golden pubescence in the centre of the sixth ventral segment, and the entirely black tarsi.

♀ very like *leucozonius* but more shining, propodeal area semicircular, not triangular, abdomen with its basal segment very shining, its disc nearly impunctate.

L. 9-10 mm.

Probably often mistaken for the preceding, but apparently widely distributed; it has been taken as far west as Ilfracombe, and also occurs in Scotland.

H. quadrinotatus, *Kirb*.—Smaller than either of the preceding; the ♂ may be known from *leucozonius*, which it most resembles, by the short round face and by the pro-

podeal area not being bounded posteriorly by a raised angulated ridge, also by the entirely pale tarsi of all the legs.

♀ with the face as broad as long, the postscutellum not villose, the propodeum rounded posteriorly; abdomen shining, irregularly punctured, second and third segments with lateral, white, pubescent, basal spots, fourth clothed with grey hairs, fifth with golden.

L. 7-8 mm.

Not rare; generally distributed in the South, and has been recorded from Wales and Scotland, so that it is probably generally distributed over Britain.

H. lævigatus, *Kirb. (lugubris, Kirb.)*.—Black, shining, head and thorax clothed with bright brown hairs, paler in the ♂; head closely and rugosely punctured, face in the ♂ wider across the eyes than long, clothed with white hairs below the antennæ, clypeus unspotted, antennæ entirely black, reaching to the apex of the propodeum; mesonotum rather strongly punctured, dull and closely in the ♂, shining and remotely in the ♀, postscutellum densely hairy in both sexes, propodeum shining, sharply truncate, basal area subtriangular ♂, or semicircular ♀, strongly rugose longitudinally, clathrate beyond the area; abdomen very shining, finely punctured in the ♂, rather coarsely, somewhat remotely, and irregularly in the ♀; first segment with erect basal hairs, second, third and fourth each with a basal band of hairs, white and rather feeble in the ♂, ochreous and dense in the ♀, especially laterally; the segments posteriorly clothed with scattered hairs, fifth in the ♀ densely clothed with golden hairs, ♂ with the ventral segments nearly glabrous, fifth depressed, largely emarginate, with a slightly raised dorsal line, armature with the laciniae narrow, emitting a long ribbon-like process which lies under the stipites; ♀ abdomen beneath densely clothed with brown hairs; legs black, extreme base and apex of the posterior tibiæ and all the tarsi in the ♂ whitish.

L. 8-9 mm.

This very distinct species is rare. It has occurred at Reigate; Ilfracombe. Shiere; (*Capron*). Shipley, Sussex; (*Gorham*). Greenwich; Charlton; Ventnor; Bristol; Scotland; (*Smith*). Moreton Hampstead; (*R. C. L. Perkins*). Fordlands, Exeter; (*Parfitt*). Land's End; Skye; Holyhead; (*Dale*).

H. sexnotatus, *Kirb.*—Large, black; head and thorax very closely and finely punctured, clothed with ashy grey hairs, face about as long as wide across the eyes, clypeus in the ♂ rather narrow, white at the apex, antennæ in that sex reaching to about the middle of the propodeum; wings dusky, postscutellum densely villose, propodeum rounded, its area finely rugose with a slightly raised central line; abdomen shining, finely punctured, puncturation remoter on the basal segment, which is clothed with grey hairs at the base, second and third with lateral basal spots of white pubescence, fifth in the ♀ with brownish hairs, ventral segments in the ♂ clothed with adpressed hairs, in the ♀ with long, erect, grey hairs, sagittæ of ♂ armature with a tuft of hairs on their outer margin; legs entirely black in both sexes.

L. 10-12 mm.

Very distinct by its ashy grey pubescence; rare. Chobham; Woking, on *Scrophularia* and Bryony. Weybridge, on Bramble; (*Smith*). Barham, Norfolk; (*Kirby*). Land's End; (*Marquand*). Croxton; (*Dale*). Exmouth; Sidmouth; (*Parfitt*). Colchester; (*Harwood*). Ireland; (*Haliday*). Lancashire; (*Gardner*).

H. prasinus, *Smith.*—Black, head and thorax very finely and closely punctured, clothed with greyish brown hairs, in the ♀ with a greenish tinge; face elongate in both sexes, below the antennæ clothed with white hairs in the ♂, the antennæ in that sex reaching to the postscutellum and the clypeus much produced, often white at the apex; propodeum not truncate, its area rounded

posteriorly, finely and longitudinally rugose at the base; abdomen rather finely and clearly punctured in the ♂, very finely and closely in the ♀, except on the basal segment, which is very shining and irregularly punctured, basal segment clothed at the sides with pale, rather pruinose pubescence, second and third segments with a similar basal band, widening at the sides, fourth with basal lateral spots in the ♂, entirely clothed with pale pubescence in the ♀, remaining segments in the ♂ clothed with pale hairs, seventh subvertical, bright red, fifth in the ♀ clothed with golden hairs, sixth pale and somewhat truncate, ventral segments with long pale hairs, ♂ with the ventral segments depressed, fourth and fifth emarginate, fringed with short golden hairs, sixth red at the apex, armature with the sagittæ produced above the surface of the stipites in two curved knife-like edges; legs black, ♂ with the tarsi, and sometimes the base and apex of the tibiae, yellow, ♀ with the scopæ brownish.

L. 8–10 mm.

Rare. Chobham; Woking; Bournemouth. Poole; Christchurch; Moffat, Scotland; Yorkshire; (*Smith*).

The red seventh abdominal segment of the ♂ and the greenish thorax of the ♀ distinguish this from all its allies.

H. cylindricus, *Fab.* (*fulvocincta*, *Kirb.*, *abdominalis*, *Kirb.*).—Head and thorax black, finely and closely punctured, especially in the ♀, rather sparsely clothed with brown hairs, face elongate in the ♂, clothed with white hairs below the antennæ, which reach to about the apex of the thorax; wings almost hyaline, nervures brown, propodeum viewed from in front sharply truncate posteriorly, the margins reflexed round the lateral angles, basal area clathrate, subtriangular in the ♂, semicircular in the ♀; abdomen shining, blackish brown, elongate and shallowly punctured in the ♂, with the first three segments generally more or less red, obovate in the ♀, all the segments brown,

basal segment rather narrow at the base, hairy at the base and sides, very shining, sparsely and very shallowly punctured, the following segments duller, more finely punctured and clothed with short brown pubescence, forming a distinct apical band, apical margins of the segments in both sexes widely pale, second and third segments in both sexes, the fourth, and often the fifth, in the ♂ with lateral basal spots of white pubescence, fifth in the ♀ densely clothed with golden hairs, beneath clothed with long hairs, ♂ ventral segments glabrous, nearly flat, armature with a round, somewhat concave lacinia, sagittæ deflexed, narrow, and pointed; legs black, clothed with golden hairs, ♂ with the base and apex of the tibiæ and the tarsi, pale, the apical joints of the latter piceous, scopæ of ♀ pale golden.

L. 8-10 mm.

Very common and generally distributed.

H. albipes, *Kirb. (obovata, Kirb.)*.—Exceedingly like the above, but generally smaller, with the pubescence paler, the ♂ narrower, its face distinctly longer, the propodeum longer, much less rugose, and without the sharply reflexed apical truncature, tarsi entirely pale.

♀, face slightly longer, propodeum slightly but distinctly longer, more narrowed posteriorly so that the apical truncature is shorter, this is also less sharp and its angles scarcely reflexed, basal area less regularly rounded.

L. 7-9 mm.

Common and generally distributed, often occurring with *cylindricus*.

H. malachurus, *Kirby*.—Another species closely allied to *cylindricus*, but distinguishable in both sexes by the closely and finely punctured basal segment of the abdomen. The ♂ may be further known by the pale underside of its antennæ, by its yellow mandibles and labrum, its more closely punctured mesonotum, and by its propodeum, which is not truncate, longitudinally rugose

at the base, its area not defined; extreme apex of femora, base, apex, and outer margin of tibiæ and the tarsi pale.

♀ differs from *cylindricus* in the ill-defined basal area of the propodeum and its less rugose sides, its apex truncate or slightly raised at the sides, but not sharply angulated as in *cylindricus*; the first abdominal segment is wider at the base, exceedingly finely punctured all over, and the entire abdomen is more densely hairy.

L. 7-9 mm.

Apparently rare. Chobham; I had a colony in a path in a garden under observation for some days. The females flew about till nearly 3.30 p.m., and then began throwing up fresh mould from their burrows; Wandsworth. Ventnor; Cromer; (*Smith*). Freshwater, Isle of Wight; (*Dale*). Hastings.

H. longulus, *Smith*.—So like the preceding that it might be easily taken for a small form of it; besides its smaller form, the propodeum, looked at from in front, is not distinctly margined and truncate on the brow, which is narrower and the base less rugose; the basal segment of the abdomen is rather more shining, the puncturation sparser.

The ♂ which I refer to this species is smaller than that of *malachurus*, with its antennæ, mandibles, &c., coloured as in that species; the propodeum more rugose, somewhat truncate, its area indefinitely limited; basal segment of the abdomen less finely and closely punctured; the apex of the femora, the base, and sometimes the apex of the tibiæ and the tarsi yellow.

L. 6-7 mm.

Chobham. Bonchurch. Ventnor and Freshwater, Isle of Wight, August and September; (*Smith*).

This seems to me to bear to *malachurus* much the same relationship that *albipes* does to *cylindricus*.

H. pauxillus, *Schenck*.—♂ only differs from the preceding in its rounder face, rather shorter antennæ, less rugose propodeum, almost impunctate first abdominal

segment, and the more shining less closely punctured following ones.

♀ more like one of the *nitidiusculus* group; black, head very finely punctured, mesonotum more remotely so than any of the preceding, somewhat shining, and with a strongly marked dorsal line; wings with testaceous nervures, propodeum clathrately rugose up to its brow, which is slightly rounded, but below the brow there is a slightly raised lateral ridge which in certain positions makes the propodeum look truncate; abdomen with the apical margins of the segments widely testaceous, basal segments very shining, nearly impunctate, the remainder dull, very finely punctured, their apices and the fourth and fifth segments clothed with pale hairs, second with a small lateral basal spot of white pubescence, legs and underside clothed with pale hairs.

L. 5-6 mm.

Not common, but probably overlooked. Hastings; Charlwood, Surrey. Shiere; (*Capron*). Glanvilles Wootton; Portland; (*Dale*).

H. subfasciatus, *Nyl.* (*lævis*, *Thoms. nec Kirb.*, *fulvicornis* ♂, *Kirb.*).—Black; head and thorax exceedingly finely and closely punctured, clothed with pale hairs; antennæ in the ♂ reaching to the third abdominal segment, bright fulvous beneath, clypeus in that sex yellow at the apex, face below the antennæ silvery-haired, and mandibles piceous; wings with piceous nervures, propodeum sharply truncate, its angles prominent, its base rather longitudinally and clathrately rugose; rugosities in the ♂ much stronger, closer, and more shining than in the ♀; abdomen very shining, segments testaceous at the apex, punctured at the base in the ♂, almost impunctate in the ♀, second and third with a basal spot of white pubescence on each side, easily rubbed off, sometimes united into a band in the ♂, third and following segments in the ♀ clothed with fine yellowish grey hairs, seventh segment in the ♂

bearing an angulated carina, ventral segments in the ♂ flat, glabrous, posterior margins nearly straight, apex of the sixth rounded, ♀ with the segments clothed with pale hairs; legs clothed with yellowish grey hairs, ♂ with the tarsi and sometimes the knees and apices of the tibiæ pale.

L. 6-8 mm.

Not a very common species, but generally distributed; recorded from Ireland, and very common in Scotland.

The long antennæ of the ♂ and the sharply truncate propodeum of the ♀ distinguish this from the other small species.

H. villosulus, *Kirb.* (♀ *punctulatus*, *Kirb.*).—Black; head and thorax sparingly clothed with long brownish grey hairs, the former very closely punctured, antennæ in the ♂ reaching to the postscutellum, pale beneath; mesonotum very shining, remotely and shallowly punctured, especially on the disc, propodeum rounded in the ♂, somewhat truncate in the ♀, radiately rugose at the base; abdomen in the ♂ rather short and subelliptic, shining, all the segments finely punctured, sides and apex clothed with grey hairs; in the ♀ the basal segment is nearly impunctate, the rest finely punctured and clothed with grey hairs, segmental margins narrowly testaceous, ventral segments in both sexes clothed with long greyish hairs; legs with greyish hairs, tarsi in the ♂ pale, at least at the base.

L. 6-7 mm.

Very common; often abounds on yellow *Compositæ*, *Crepis*, &c.

H. puncticollis, *Mor.*—Very like the preceding, but slightly larger, face longer and narrower, especially in the ♂, which has the antennæ entirely black, the labrum and mandibles pale, the mesonotum less shining, more closely and largely punctured, propodeum much more rugose, its basal area clearly defined.

♀ with the mesonotum shining, very largely punctured, propodeum much as in the ♂, abdomen as in *villosulus*, but the margins of the third and following segments only, testaceous.

L. 7-8 mm.

Hastings and Guestling. I know of no other localities.

H. lævis, *Kirb.*—This species, of which only the ♀ is known, is very distinct, it is rather larger than *villosulus*, the mesonotum is punctured very much as in that species, though not quite so remotely, but the abdomen is distinctly larger, and practically impunctate, the tarsi also are testaceous.

L. $8\frac{1}{2}$ mm.

The only British exponent of this species was taken at Nacton, Suffolk, as recorded by Kirby in his Monographia.

H. breviceps, *Saund.* (♂ *brevicornis*, *Saund.*, *synopsis*, *nec Schenck*).—♂ smaller than *villosulus*, mandibles, labrum and apex of clypeus yellow, antennæ pale beneath, only just reaching to the scutellum, mesonotum more closely punctured, wings with the second submarginal cell much wider than in *villosulus*, propodeum radiately striate at the base, abdomen short, all the segments closely punctured, and clothed with greyish pubescence at the sides, ventral segments clothed with short hairs; apex of the tibiæ, front of anterior pair, and all the tarsi whitish.

♀ easily known by its wide face, which is wider across the eyes than long, its largely, closely, and deeply punctured mesonotum, and the testaceous nervures of its wings, the basal segment of the abdomen is very shining and punctured at its apex, all the others are punctured, their margins widely testaceous.

L. 6 mm.

Woking; Chobham; Bromley; Hayling Island; Guestling, near Hastings.

H. punctatissimus, *Schenck.* (*longiceps*, *Saund.*).—Head and thorax clothed with greyish hairs, the former

finely punctured, face very elongate, much longer than wide, ♂ with the apex of the clypeus, mandibles, and labrum pale yellow, its antennæ pale beneath, reaching to the postscutellum; mesonotum dull, strongly and distinctly punctured, propodeum somewhat rounded, longitudinally rugose at the base; abdomen in the ♂ dull, finely but distinctly punctured on the first three segments, indistinctly on the rest; in the ♀ with the basal segment shining, finely punctured on its apical half, following segments closely punctured and clothed with grey hairs, ventral segments in the ♂ with a few erect pale hairs near the centre of each, in the ♀ rather densely fringed with grey hairs; legs clothed with grey hairs, ♂ with the metatarsi generally, and the extreme apex of the femora pale.

L. 6-7 mm.

Woking; Chobham; Wandsworth; Reigate; Southwold; Bournemouth; Hayling Island; Deal; Hastings; Sidmouth, var. of ♂ with black tarsi; (*R. C. L. Perkins*). Colchester; (*Harwood*). Lowestoft; (*Morice*). Norfolk; (*Bridgman*). Gloucestershire; (*Perkins*). Land's End; (*Marquand*). Maidstone; (*Frisby*).

I have taken it at Chobham, burrowing at the roots of heath.

H. nitidiusculus, *Kirb.*—Black, with a slight bronzy tinge in some lights, face much shorter than in the preceding, the mesonotum much more finely punctured, mouth parts of the ♂ similarly coloured, but antennæ longer, testaceous beneath; propodeum finely rugose at the base; abdomen shining, finely punctured on all the segments, and closely on all except the basal segment of the ♀, very elongate in the ♂, their apices in the ♀ widely testaceous, ventral segments shining and somewhat concave in the ♂, with long lateral tufts of white hairs, in the ♀ fringed with grey hairs; ♂ with the front of the anterior tibiæ and the base and apex of all the pairs as well as the tarsi pale yellow.

L. 6 mm.

A very common species everywhere; easily known by the white ventral tufts of the ♂, and the finely punctured mesonotum and basal segment of the abdomen in the ♀, this combination is not found in any other of our small species.

H. minutus, *Kirb.*—Deep black, shining, very like the preceding, but the ♂ with the labrum black, the mandibles piceous, the puncturation of the mesonotum stronger, the abdominal segments without the long ventral tufts of *nitidiusculus*, and the stipites of the armature with a reflexed ribbon-like appendage, the tibiæ and tarsi entirely black.

♀ with the mesonotum more shining and more strongly punctured, and all the segments of the abdomen less closely punctured, especially the second and third, their apices scarcely discoloured, basal segment very shining with a few shallow punctures near the apex.

L. 6 mm.

Much rarer than the preceding, though probably confused with it. I have taken it at Woking, Chobham, and Tunbridge Wells. Shiere; (*Capron*). Bickleigh, Devon; (*Bignell*). Norfolk; (*Bridgman*). Gloucestershire; (*Perkins*). Lancashire and Cheshire; (*Gardner*). Bury St. Edmunds (*Tuck*). Ballygarret, Ireland; (*Cuthbert*).

H. atricornis, *Smith.*—Exceedingly like *minutus*, but rather larger, with a distinctly longer face, chiefly due to the longer and more produced clypeus, mandibles in the ♂ nearly black, mesonotum in both sexes more convex, less regularly punctured, the punctures more unequal in size, in the ♂ with a strongly impressed dorsal line, in the ♀ with a very fine one, propodeum rather more largely rounded in both sexes, and in the ♂ with its area more rugose, its brow rather sharper; abdomen very shining, ♂ with the puncturation of the second and following segments less close, and shallower; armature with the stipites produced into two elongate processes, the outer one shorter

than in *minutus*, and not turned back under the armature; ♀ with the abdomen more convex than in *minutus*, the basal segment wider and the apices of the segments almost concolorous.

L. $6\frac{1}{2}$ – $7\frac{1}{2}$ mm.

Near Manchester; (*B. Cooke*). Stratford, near Manchester; (*J. R. Hardy*). Rugby, not uncommonly; Whalley, near Clitheroe; (*Morice*). Wotton-under-Edge; (*R. C. L. Perkins*).

A very distinct species, but *atricornis* is rather a misleading name, as the antennæ of the ♂ are quite pale beneath.

H. minutissimus, *Kirb.*—This little species is hardly likely to be confounded with any of the preceding; it is smaller, and in the ♀ narrower than any of the others, the face in both sexes is of a peculiarly regular oval shape, the mesonotum is dull, strongly punctured, and has an unusually deep dorsal line, the abdomen in the ♂ is rather strongly punctured, the first and second segments are unusually convex, and there is a very distinct dorsal constriction between the first and second, the second being largely impressed at its base, there is also a very slight constriction between the second and third; in the ♀ the abdomen is very narrow, the basal segment is nearly impunctate, the remainder closely punctured; the legs in both sexes are entirely black, clothed with grey hairs.

L. 5 – $5\frac{1}{2}$ mm.

Widely distributed in the South of England, and probably elsewhere, though not recorded.

H. tumulorum, *Linn.*—Bronzy green, head and thorax dull, finely and very closely punctured; ♂ with the antennæ reaching to the base of the abdomen, pale beneath, the face clothed with grey hairs, and the labrum and mandibles pale; ♀ with the antennæ ferruginous towards the apex; wings with the nervures pale in both sexes, the propodeum rugose within the area, which is somewhat triangular in the ♂ and subtruncate posteriorly in the ♀; abdomen in

the ♂ shining, rather remotely punctured, the segments much impressed at the base and slightly at the apex, which is discoloured and impunctate, each with a slight indication of an apical, and the second and third also of a basal pubescent band; in the ♀ dull, very closely punctured, and clothed with yellowish hairs, intermixed with darker ones, each segment with a well-defined, paler, apical band, fifth and sixth clothed with golden hairs, glabrous area of the sixth narrow and testaceous, with a central basal carina, fifth ventral segment in the ♂ rather deeply emarginate, sixth subtruncate, with a small basal fovea, armature with the lacinia concave, subfoliaceous, dilated at the apex, ♀ with the ventral segments clothed with pale hairs; legs yellow in the ♂.

L. 7 mm.

Common and generally distributed.

H. gramineus, *Smith*.—Easily distinguished from the preceding by the short antennæ of the ♂, which only reach to the middle of the propodeum, and the bronzy femora; in the ♀ by the denser, almost fulvous, pubescence, by the pale yellow tegulæ and nervures at the base of the wings, and by the anterior tibiæ in front being flavous, the others at the base, and the tarsi, being of the same colour.

L. 6–7 mm.

Very rare, only recorded for certain from Cove Common, Hants; (*Smith*).

H. Smeathmanellus, *Kirb.*—Bronzy or bluish green, sparingly clothed with whitish hairs, shining; head finely and closely punctured, ♂ with a white spot on the clypeus, and the antennæ reaching to the apex of the propodeum, fulvous beneath, face in the ♀ rather long; mesonotum shining, rather irregularly punctured, the interstices bright and smooth, propodeum rugose, especially in the ♂, somewhat rounded posteriorly; abdomen black, shining, the segments punctured at the base, with greenish reflections in the ♂, more distinctly green in the ♀, in which sex the

apical margins are pale testaceous, second and third segments with basal spots of white pubescence at the sides often united into bands, fifth segment in the ♀ with pale hairs at the apex, ventral segments clothed with white hairs, armature of the ♂ with the lacinia emitting a ribbon-like appendage which lies under the stipes; legs black, clothed with pale hairs, in both sexes.

L. 6-6½ mm.

Common and generally distributed.

H. morio, *Fab. (æratas Kirb.)*.—Head and thorax bronzy green, the former very closely and finely punctured, antennæ in the ♂ pale beneath, reaching to about the apex of the propodeum, clypeus considerably produced; ♀ face as long as wide across the eyes; mesonotum dull, finely rugulose between the punctures, propodeum rugose at the base, somewhat rounded at the apex; abdomen black, segments scarcely impressed at the base, rather strongly punctured except at the apex in the ♂, finely in the ♀, the basal segment almost impunctate, the following clothed with pale pubescence, second and third in both sexes with a basal lateral spot of white pubescence, pubescence easily rubbed off; ventral segments in the ♂ sparsely, in the ♀ densely, clothed with whitish hairs; legs entirely black in both sexes, clothed with silvery hairs.

L. 6-7 mm.

Very common and generally distributed.

H. leucopus, *Kirb.*—♂ abundantly distinct from our other bronzy species by the pale flavous mandibles and labrum, the short antennæ, which do not quite reach to the scutellum, the shorter abdomen, and the colour of the legs which have the base and apex of the tibiæ and the whole of the tarsi pale flavous; ♀ very difficult to distinguish from *morio*, but it has a broader, rounder face, the mesonotum is more shining, its puncturation being rather larger and more remote, and the intervals less rugulose, the propodeum is more widely and truncately rounded posteriorly, and the

abdomen even in fresh examples has no white pubescent spots.

L. 5-6 mm.

Not so common as *morio*, but widely distributed. It occurs in Scotland, but I have no Irish record.

ANDRENA, Fab.

This genus is the richest in species of all the British genera of the *Anthophila*; its characters are fairly well defined, although some of the species superficially resemble *Halictus*. ♂ narrower and often smaller than the ♀; tongue lanceolate, paraglossæ obtuse, labial palpi with four cylindrical joints, maxillary palpi six-jointed, submentum hyaline, lora distinct, head in the ♂ often very large, usually larger than in the ♀, but often variable in size in the same species; ♀ with an impression on the inner side of each eye towards the vertex, filled with velvety pubescence; anterior wings with three submarginal cells; abdomen with seven dorsal segments exposed in the ♂, six in the ♀, the sixth with a distinct dorsal area; six ventral segments exposed in the ♀, eight in the ♂, although the seventh is almost entirely hidden under the sixth. The ♂ armature affords hardly any specific characters among closely-allied species, the stipites as a rule are dilated and converge to the apex, there is no distinct lacinia, and the sagittæ are narrow and pointed; sting of the ♀ feeble; both sexes have a patella on the posterior tibiæ, which in the ♀ also bear a well-developed scopa, and are slightly dilated; the posterior coxæ bear a tuft of curled hairs called the *floccus*, which is often a prominent character. The most important structural characters in the ♂ seem to occur in the labrum, clypeus, the relative lengths of the second, third, and fourth antennal joints, the general puncturation, and the form of the eighth or terminal ventral segment; in the ♀, in the shape of the face, the puncturation, and the sculpture of the apical dorsal

valve. The colour of the pubescence in fresh examples, which is nearly always brighter in the ♀ than in the ♂, affords good characters, but it fades quickly after exposure to the weather, and is reduced by degrees to a general grey. The colour and distribution of the pubescence is also seriously affected by the presence in the abdomen of the little parasite *Stylops*, which frequently attacks some of the species. Professor Perez, of Bordeaux, has given an excellent account of the habits of the parasite in relation to *Andrena* in his "Des Effets du Parasitisme des *Stylops*, &c.," published in the *Actes de la Soc. Linn. de Bordeaux*, 1886. As a rule, the presence of the parasite may be known by the protrusion of its head between the segments, or by the distorted and often inflated appearance of the abdomen, but there are cases where the parasite has affected the appearance of the bee by its effect on the larva, and has escaped during the final change. The parasite enters the bee in its larval state, and more or less affects the genital organs; it may not render them abortive or useless, and in some cases, according to Mr. R. C. L. Perkins' observations, may affect them very slightly, but the results which chiefly concern the Hymenopterist all tend towards the assimilation in outward appearance of the two sexes, which goes a long way to show that they must be due to effects on the generative system. If a ♂ be affected its head tends to become smaller, the pubescence of the abdomen to become denser and to form paler apical bands, the legs to become more densely hairy, and in species which have a white clypeus this is liable to become black in part or altogether; in a ♀ the head also tends to become smaller, but the scopæ to become less dense and paler, as also the pubescence of the abdomen, but, as in the ♂, it tends to form pale apical bands; in species where the ♂ has a white clypeus the stylopized ♀ often has it white or partly white; there is also often an immature look about stylopized specimens of either sex.

Several species used to exist in our list characterized only by the effects of stylopization. Many of our species are double-brooded, occurring in early spring and again in July or August. In some cases the autumn brood slightly differs from the spring one, especially in the ♂ sex. The species of *Andrena* often form colonies, sometimes extensive ones, generally in banks or pathways, or often on commons amongst the grass, &c. Most of the species occur in the spring, and are partial to the flowers of *Salix*; after these have died off, dandelions, bryony, blackberry, and other open flowers whose honey short-tongued bees can reach, attract them. The males do not always occur with the females, although they are probably flying about near the flowers which they frequent, they much less rarely settle, and are often very difficult to catch, especially when coursing up and down a hedge as they often do. Smith says that their burrows vary from about six to twelve inches in depth, and that the cells, with the exception of the terminal one, are placed in short branches from the main stem. Many of the species of this genus are attacked by the inquiline genus *Nomada*, which lays its egg by the side of that of the *Andrena*, and its larva consumes the food stored up by its host, and comes to perfection in its stead. There is another little creature often found on species of this genus, viz. the larva of *Meloe*. In its very early stages it is a little elongate yellow, or more rarely black, hexapod with long caudal setæ, but it does not seem to affect the *Andrena* injuriously.

Altogether there are forty-eight British species, and the number of known species is quite problematical. The genus is one of very wide distribution, but seems to be chiefly found in temperate regions.

It is necessary to warn collectors against mistaking the colour of the pollen on the *scopæ* for the colour of the *scopæ* themselves.

- (8) 1. Basal area of propodeum clathrately rugose, bounded by a raised line; ab-

- dominal segments without distinct apical bands, clypeus not white in the ♂.
- (3) 2. Anal fringe golden. ALBICANS.
 (2) 3. Anal fringe brown or black.
 (7) 4. Colour not deep black, abdominal hairs pale.
 (6) 5. ♂, abdomen dull, unspotted, antennæ longer and thicker, armature large, tibiæ generally pale at the apex; ♀, posterior tibiæ clear testaceous. TIBIALIS.
 (5) 6. ♂, abdomen somewhat shining, antennæ shorter and thinner, armature small, tibiæ entirely black in both sexes. BIMACULATA.
 (4) 7. Colour coal black, hairs of abdomen black. PILIPES.
 (1) 8. Basal area of propodeum not enclosed by a raised line, rarely finely clathrate at the base, and when so, as in *labialis*, then with distinct white lateral bands on the abdomen.
 (14) 9. Abdomen coal black or bluish black, shining, its pubescence black or white, not brown; ♀ with the anal fringe, and scopa outwardly, black.
 (13) 10. Hairs of thorax bright brown.
 (12) 11. Hairs of face black. THORACICA.
 (11) 12. Hairs of face white. NITIDA.
 (10) 13. Hairs of thorax grey or black and white.
 (9) 14. Abdomen more or less clothed with brown or pale hairs, or with pale apical bands on the segments.
 (56) 15. Abdomen densely hairy; or polished and shining without white pubescent apical bands; or dull with broad entire apical bands; anal fringe in ♀ always brown or black or mandibles widely membranous beneath; ♂ clypeus always black.
 (53) 16. Head of ♂ not nearly twice as wide as the mesonotum between the wings; ♀, mandibles beneath not widely membranous.
 (40) 17. Abdomen without pale pubescent bands or with the bands only slightly paler than the rest of the pubescence, often visible only in certain positions, or with the scopæ of the ♀ golden.
 (19) 18. ♂, third joint of antennæ much shorter than the fourth; ♀, third joint of antennæ shorter than fourth and fifth together. TRIMMERANA.
 (18) 19. ♂, third joint of antennæ longer than

- the fourth; ♀, third joint of antennæ longer than the fourth and fifth together, or at any rate twice as long as the fourth.
- (21) 20. Abdomen clearly punctured on a nearly smooth surface, nearly always more or less red FLOREA.
- (20) 21. Abdomen not clearly punctured on a nearly smooth surface; not red.
- (25) 22. ♂, abdomen clothed with pale hairs, not polished; thorax with bright fulvous hairs and mandibles with a large basal tooth, or tibiæ pale at the apex; ♀, abdomen densely clothed with black or bright fulvous red hairs.
- (24) 23. ♂ with mandibles toothed at the base; ♀, abdomen fulvous haired FULVA.
- (23) 24. ♂, mandibles simple; ♀, abdomen black haired CLARKELLA.
- (22) 25. ♂, tibiæ entirely black or abdomen polished, mandibles toothed at the base only in species which either have the abdomen polished or the thoracic hairs sooty brown; ♀, abdomen not black or bright fulvous-haired.
- (31) 26. ♂, head of normal size, vertex not quadrate, mandibles simple; scopæ of ♀ fulvous.
- (28) 27. Large species, 12-14 mm. NIGRO-ENEA.
- (27) 28. Small species, 9-10 mm.
- (30) 29. ♂, third joint of antennæ not so long as the two following together; ♀, third joint slightly longer than the following two GWYNANA.
- (29) 30. ♂, third joint of antennæ longer than the two following together, ♀, third joint almost equalling the three following ANGUSTIOR.
- (26) 31. ♂, mandibles toothed beneath at the base, or head large, with subquadrate vertex; scopæ of ♀ brown or black.
- (35) 32. ♂, mesonotum clothed with sooty brown hairs; ♀, fifth abdominal segment clothed with pale hairs, or with the third antennal joint very long and slender at its base, which is not more than half as wide as its apex.
- (34) 33. Larger, first recurrent nervure received near the apex of the second submarginal; basal mandibular tooth in ♂ pointed, fifth abdominal segment in ♀ clothed with black hairs LAPPONICA.
- (33) 34. Smaller, first recurrent nervure re-

- ceived in the centre of the second submarginal, mandibular tooth in ♂ blunt; fifth abdominal segment in ♀ clothed with pale hairs PRECOX.
- (32) 35. ♂, mesonotum clothed with bright brown hairs; ♀, fifth abdominal segment clothed with black or brown hairs and base of third antennal joint, more than half as wide as the apex.
- (37) 36. ♂, head large, vertex subquadrate, mandibles not toothed at the base; ♀, hairs of face black VARIANS.
- (36) 37. ♂, head of normal size, mandibles with a fine small tooth at the base, ♀, hairs of the face pale.
- (39) 38. Labrum narrower, more pointed, less emarginate in both sexes, abdomen with white hairs in the ♀ HELVOLA.
- (38) 39. Labrum wider, more emarginate in both sexes, abdomen without white hairs in the ♀ FUCATA.
- (17) 40. Abdomen with well-defined pale pubescent bands visible in all positions.
- (50) 41. ♂, labrum with a somewhat quadrate tubercle deeply notched at the apex; ♀, scopæ not bright fulvous.
- (49) 42. Hairs on the disc of the mesonotum pale or fulvous; ♂ with broad pale pubescent abdominal bands.
- (46) 43. Eighth ventral segment in ♂ emarginate, abdominal hairs semi-erect; fifth segment in the ♂ with some dark hairs at the base, in the ♀ clothed with black, or nearly black, very projecting hairs.
- (45) 44. ♂, joints of flagellum considerably longer than wide; ♀, hairs of face black NIGRICEPS.
- (44) 45. ♂, joints of flagellum scarcely longer than wide; ♀, hairs of face pale SIMILIMA.
- (43) 46. Eighth ventral segment in the ♂ entire, abdominal hairs less erect, fifth dorsal segment in the ♂ clothed entirely with concolorous pale hairs, in the ♀ with pale or brown hairs, which are much more decumbent than those of the two preceding.
- (18) 47. ♂, abdominal bands not very distinct; ♀, apical fringe and scopæ golden brown TRIDENTATA.
- (47) 48. ♂, abdominal fasciæ very distinct, sixth ventral segment much re-

- flexed at the apex; ♀, apical fringe and scopæ dull brown PUSCIPES.
- (12) 49. Hairs on the disc of mesonotum black; ♂ with the pale pubescent abdominal bands very narrow DENTICULATA.
- (11) 50. ♂, labrum with the tubercle transverse, simple; ♀, scopæ bright fulvous.
- (52) 51. Both sexes with the hairs of the face fulvous FULVICRUS.
- (51) 52. Both sexes with the hairs of the face white FASCIATA.
- (16) 53. Head of ♂ twice as wide as mesonotum between the wings; ♀, mandibles widely membranous beneath.
- (55) 54. Tibiæ entirely clear testaceous in both sexes FEROX.
- (54) 55. Tibiæ pale only at the apex in the ♂; black in the ♀ BUCEPHALA.
- (15) 56. Abdomen not densely hairy, pubescent bands narrow, nearly always more or less interrupted; anal fringe nearly always golden in the ♀, mandibles not widely membranous beneath; ♂ clypeus often white.
- (62) 57. Abdomen more or less red or pale, or species very large with smoky wings.
- (59) 58. Species very large, wings smoky HATTORPIANA.
- (58) 59. Species smaller, wings clear.
- (61) 60. Abdomen testaceous or brown, segments with paler apical margins CETIL.
- (60) 61. Abdomen black, with a broad, red band CINGULATA.
- (57) 62. Abdomen entirely black rarely with slightly piceous margins.
- (78) 63. Abdomen polished and shining.
- (67) 64. Legs entirely black in both sexes, clypeus black. ♀, abdominal bands entire.
- (66) 65. Abdomen distinctly punctured ARGENTATA.
- (65) 66. Abdomen not punctured ALBICRUS.
- (64) 67. Tibiæ or tarsi more or less pale, or abdominal bands widely interrupted.
- (75) 68. ♂, clypeus white, or if black then with distinct white lateral lines of pubescence on the apices of the second and following segments.
- (72) 69. ♂, clypeus white and tarsi testaceous; ♀, tibiæ testaceous.
- (71) 70. ♂, apex of tibiæ, at least, testaceous; ♀, wings brownish with pale yellow nervures CHIRYSOSCELUS.

- (70) 71. ♂, tibiæ entirely black; ♀, nervures of wings dark ANALIS.
- (69) 72. ♂, either with tarsi or clypeus black; ♀, tibiæ black.
- (74) 73. ♂, clypeus white; ♀, scutellum closely punctured, especially at the sides . . . COITANA.
- (73) 74. ♂, clypeus black; ♀, scutellum very remotely punctured. LUCENS.
- (68) 75. ♂, clypeus black, with pale pubescent abdominal bands only on the apical segments; ♀ without abdominal bands.
- (77) 76. Smaller, rather coarsely punctured . . . FULVAGO.
- (76) 77. Larger, finely and closely punctured . . . POLITA.
- (63) 78. Abdomen more or less dull, either from the closeness of the puncturation or the fine rugulosity of the surface.
- (82) 79. ♂, clypeus white; ♀, abdomen with anal fringe golden, unbanded, or strongly punctured.
- (81) 80. Abdomen without lateral pubescent pale streaks HUMILIS.
- (50) 81. Abdomen with lateral pale streaks, strongly punctured LABIALIS.
- (79) 82. ♂, clypeus black; ♀, abdomen with lateral pale pubescent spots or bands, not strongly punctured.
- (86) 83. Species very small and black, pubescence of thorax silvery or grey.
- (85) 84. Abdomen not punctured MINUTULA.
- (84) 85. Abdomen punctured NANA.
- (83) 86. Species not very small; pubescence of thorax brown.
- (91) 87. Hairs of the face brownish or pale fulvous.
- (89) 88. Propodeum finely but clathrately rugose at the base PROXIMA.
- (88) 89. Propodeum finely rugose not clathrate.
- (91) 90. ♂, abdomen with only short lateral white streaks; ♀ with a dense tuft of curved hairs on each side of the propodeum DORSATA.
- (90) 91. ♂, abdominal bands almost entire; ♀, propodeum simply hairy at the sides.
- (93) 92. ♂, antennæ longer; ♀, wings with a slightly fulvous tint, anal fimbria golden WILKELLA.
- (92) 93. ♂, antennæ shorter; ♀, wings without a fulvous tint, anal fimbria brownish or pale AFZELIELLA.
- (57) 94. Hairs of face white; post scutellum in the ♀ densely clothed with fulvous hairs SIMILIS.

A. albicans, *Kirb.*—Black; head and thorax finely and closely punctured in the ♂, more coarsely in the ♀; face in the ♂ clothed with pale fulvous, in the ♀ with white hairs, antennæ in the ♂ reaching to about the propodeum; thorax in the ♂ entirely clothed with fulvous hairs, which are brighter and redder on the mesonotum, in the ♀ with the mesonotum, scutellum and postscutellum very densely clothed with bright fulvous red hairs, the propodeum and underside of the thorax with white, wings subhyaline, propodeal area well-defined and clathrately rugose; abdomen shining, punctured, more coarsely so in the ♀, clothed with a few scattered pale hairs along the sides, sixth segment, dorsally, testaceous at the apex in the ♂, and with the seventh clothed with golden hairs, fifth entirely and sixth at the sides, in the ♀ densely clothed with bright fulvous red hairs, sixth triangularly raised in the centre of its glabrous portion, beneath in both sexes with the segments fringed with pale hairs, apical segment in the ♂ densely pubescent: legs black, clothed with golden hairs, intermediate tarsi in the ♂ and the posterior tibiæ and tarsi in both sexes clear testaceous, the tibiæ in the ♂ often with a more or less extensive dark spot.

L. 10—11 mm.

A very distinct species recognizable at once by its punctured abdomen, with its bright red apex, and clathrate basal area of the propodeum; generally distributed and very common in spring; one of our earliest species, it frequents various flowers, especially Sallows and Dandelions.

A. pilipes, *Fab.*—Black, clothed with black hairs, those of the thorax especially in the ♂, generally more or less sooty grey; head and thorax rugosely punctured, face in the ♂ densely clothed with long black hairs, wings smoky brown, darker at the apex, propodeum with a well-defined triangular clathrate area; abdomen shining, the segments rugosely punctured throughout, impressed along their apical margins, more or less clothed with black hairs,

apical segments densely so, beneath shining and finely punctured in the ♂, densely punctured and dull in the ♀; posterior tibiæ in the ♀ with the scopa white outwardly.

L. 12–15 mm.

Cannot be confounded with any of our other species; it is not very common, appearing in April and sometimes again in July and August. It frequents Dandelions, Thistles, &c. Chobham; Hastings; Bournemouth. Southend; Darenth; Shirley; Sidmouth; (*Smith*). Lizard; (*Dale*). Land's End; (*Marquand*). Ventnor; Ipswich; (*Rothney*). Colchester; (*Harwood*). Ramsgate; (*Marshall*). Norfolk; (*Bridgman*). Bury St. Edmund's; (*Tuck*).

A. tibialis, *Kirb.* (*atriceps* Kirby; stylopized ♂ = *Mouffetella* Kirby). Black; head punctured, more or less longitudinally strigose above the antennæ especially in the ♂, which has also the face densely clothed with brown hairs, the mandibles simple at the base, and the antennæ thick, reaching a little beyond the middle of the propodeum, in the ♀ the face is clothed with whitish hairs intermixed with a few dark ones at the sides; thorax entirely clothed with pale fulvous hairs in the ♂ and in the ♀ with bright fulvous hairs above, and with pale at the sides and beneath, mesonotum largely and rugosely punctured in both sexes, wings subhyaline, propodeum with a well-defined clathrate basal area; abdomen rugosely punctured, clothed with pale hairs, which form indefinite bands at the apices of the segments, and are intermixed on the apical segments in the ♂ with darker ones, ♀ with the fifth segment densely fringed at the apex, and the sixth at the sides, with brown hairs, the centre of the latter slightly raised; ventral segments fringed at the apex with long pale hairs, punctured very closely in the ♀, in which sex each has a slight central impression near the apex, ♂ armature very large; legs clothed with pale fulvous hairs in the ♂, femora in the ♀ with white hairs, floccus white, intermediate tibiæ

with brown, scopa golden, posterior tibiae clear testaceous in the ♀, testaceous towards the apex only, in the ♂.

L. 13-15 mm.

A common early spring species, occurring on Sallows, Dandelions, &c. Very subject to the attacks of *Stylops*. I have an example with four parasites in it.

A. bimaculata, *Kirb.* (Second brood=*decorata*, *Smith*, *vitrea*, *Smith*, *conjuncta*, *Smith*, *prætexta*, *Smith*?) Very like *tibialis* but darker and rather smaller in both sexes, and with the legs entirely black; in the ♂ the antennæ are rather shorter and more slender, the puncturation is finer, and the apical impressions of the abdominal segments are more shining and often almost impunctate, and the second segment beneath has sometimes a reddish spot on each side, the armature is much smaller, and the legs are rather more slender; the ♀ has the face clothed with brown hairs, the underside of the thorax, and the femora with pale brown, not white, hairs, floccus and scopæ pale brownish; abdomen more finely punctured than in *tibialis*, and with the impressed apices of the segments often nearly impunctate, basal segment often, and the second rarely, more or less red towards the apex, and second segment beneath generally with a red spot on each side.

L. 12-14 mm.

Not common. Occurs in early spring on Sallows, and in July and August on Briars, &c.; is rarely stylopized. Woking; Chobham, both broods; Bournemouth, autumn brood. Norwich, both broods; (*Bridgman*). Lowestoft, autumn; (*Morice*). Tavistock, spring; (*Swale*). Bury St. Edmund's, spring; (*Tuck*). Colchester; (*Harwood*). Shirley, Windsor, Sidmouth, autumn; (*Smith*). The clathrate basal area of the propodeum at once distinguishes this species from any other similarly coloured, except *tibialis*. *Prætexta* *Smith* is a very curious insect with fulvous anal fimbria, and suggests to my mind a cross between this species and *pilipes*.

A. rosæ, Panz. (*Trimmerana*, Kirb., *spinigera*, Kirb., *eximia*, Smith : stylopized var. = *piceicornis*, Kirb., *picipes*, Kirb.) Black ; head and thorax rather finely, and the latter remotely punctured, clothed with brown hairs, face in the ♂ of the var. *spinigera* with black or nearly black hairs, in the other varieties and in all the females with brown. Cheeks in the ♂ with a distinct angle below the base of the mandible, this in var. *spinigera* is produced into an elongate spine of variable length, antennæ unusually long in both sexes, third joint in the ♂ much shorter than the fourth, in the ♀ shorter than the fourth and fifth together, the joints of the flagellum in the ♂ slightly arcuate ; mesonotum densely clothed with brownish hairs in the black, more sparingly in the red bodied varieties, wings nearly hyaline, basal area of the propodeum finely rugose at the base, somewhat shining towards the apex ; abdomen punctured in the ♂ and shining, finely rugulose but not distinctly punctured, shining in the red varieties of the ♀, sometimes entirely black, except the piceous apical margins of the segments (var. *Trimmerana* and dark form of *rosæ*), sometimes (var. *spinigera* and *rosæ*) with the first and second segments more or less red in both sexes, and more rarely with the third also red ; in the dark varieties the pubescence is much more abundant, and forms paler bands along the apices of the segments, the second segment in the ♂ bears a patch of longer hairs near its centre ; apical fringe of the ♀ dark brown, apical dorsal valve not triangularly raised in the centre, generally punctured, but nearly impunctate in some varieties of the autumn brood (*rosæ*). Segments beneath fringed with long pale hairs, apical ventral valve in the ♂ emarginate at the apex, except rarely in some varieties of *rosæ* ; legs clothed with brown hairs, scapæ outwardly dark brown, pale beneath.

L. 10-15 mm.

Var. *Trimmerana* is very common on Sallows in the early

spring, and generally distributed. The form with the spinose cheeks in the ♂, and red spotted abdomen in the ♀ (*spinigera*) is rarer, and occurs with it; it has been taken at Reigate; Hastings; Ventnor; Tunbridge Wells; Canterbury. Barham; (*Kirby*). Exeter; Highgate; Esher; (*Smith*). Land's End; (*Marquand*). Maidstone; (*Frisby*). The autumn brood (*rosæ*) frequents briars, &c., and has occurred at Hastings; Bournemouth; Reigate. Shirley; (*Rothney*). Ilfracombe; Sidmouth; (*Smith*). Colchester; (*Harwood*). Land's End; (*Marquand*).

I have no doubt of the identity of these three forms. The comparative lengths of the antennal joints are alike in them all, and different from all our other species. I used to think that *rosæ* was distinct from the spring form by the entire apical ventral valve of the ♂, and the impunctate dorsal valve of the ♀, but on examination of many specimens I find that these characters vary, as I have autumn *rosæ* ♂ with emarginate valve, and ♀ with the dorsal valve distinctly punctured, therefore I unite them without fear. From Panzer's figure and description of *austriaca* it is clear that he cannot have meant to represent *rosæ*, as he both figures and describes the posterior segments as fringed apically with white hairs. The spring form is frequently stylopized.

A. florea, *Fab.*—Black. Head and thorax clothed in the ♂ with ochreous, in the ♀ with brown hairs, antennæ in the ♂ short, not reaching to the scutellum, fourth joint not more than half so long as the third, and the vertex of the head rather quadrate; mesonotum dull, finely punctured, puncturation closer in the ♀, wings slightly dusky, propodeum finely rugose; abdomen shining, first segment scarcely punctured, the rest clearly so, more finely and closely in the ♀, first and second segments in both sexes more or less widely red at the apex, the remainder narrowly testaceous at the apex, third and fourth in the ♀ with an apical line of golden hairs, apical fimbria dark

brown, beneath punctured, apices of the segments with fringes of long hairs; legs clothed with brown hairs, femora and tibiæ in the ♀ with pale hairs beneath, scopæ outwardly, and the tarsi, clothed with black-brown hairs.

L. 11-12 mm.

Not common; it occurs in June and July, and is very partial to the flowers of Bryony. Woking and Chobham. Highgate; Weybridge; Blackwater, Hants; Bideford; Ilfracombe; (*Smith*). Bickleigh; Exeter; (*Parfitt*). Gloucestershire; (*V. R. Perkins*). Bexhill; (*Frisby*). Penenden; (*Marshall*). Easily known from the other red bodied species by the clearly punctured abdomen, and short antennæ of the ♂.

A. thoracica, *Fab.* (♂ *melanocephala*, *Kirby*).—Black; head and thorax rugosely punctured, the former densely clothed with black hairs, and with a fringe of brown hairs posteriorly; thorax densely clothed with bright fulvous hairs above, with black beneath; abdomen very shining and finely punctured especially in the ♀, the second and following segments impressed at the apex, surface clothed with short black hairs in the ♂, first and second segments glabrous in the ♀, anal fringe black, segments beneath fringed with long black hairs, their bases impressed in the ♂; legs densely clothed with black hairs.

L. 13-16 mm.

A very fine distinct species, occurring in April, and often again in July and August, and sometimes very abundant. It frequents Sallows, Dandelions, and other flowers; widely distributed in the South of England, but Lancashire is the only northern record I have for it.

A. nitida, *Fourc.* (var. *consimilis* *Smith*). Very like *thoracica* but differing in having the face clothed with white hairs, margined with black along the margins of the eyes, the vertex with fulvous; thorax clothed above with fulvous but beneath with white hairs; abdomen shining, punctured, more finely so in the ♀, sparingly

clothed with pale hairs, intermixed with black on the third and following segments of the ♂, in the ♀ sub-glabrous, the sides of the segments with patches of pale hairs, the fourth with a few black hairs, apical fringe black, that of the ♂ fulvous, beneath with the segments fringed with whitish hairs in both sexes; legs clothed in the ♂ with pale brownish hairs, in the ♀ with darker brown, those of the coxæ, trochanters, and femora beneath, white in both sexes, scopæ in the ♀ paler beneath.

L. 12-14 mm.

Common in the spring in some localities; as a rule frequenting Dandelions; generally distributed, but local. Wandsworth; Hastings; Woking. Norfolk; (*Bridgman*). Colchester; (*Harwood*). Bury St. Edmunds; (*Tuck*). Clapton Marshes; Kent; (*Marshall*). Gloucestershire; (*Perkins*). Lancashire and Cheshire; (*Gardner*). Exeter; (*Parfitt*). Land's End; (*Marquand*). Ireland; (*Haliday*). Rarely stylized.

Consimilis Smith is a beautiful variety with fulvous anal fimbria and scopæ, possibly the effect of stylization.

A. cineraria, *Lin.*.—Blue black, head and thorax densely clothed with ashy grey hairs, the latter in the ♀ with a broad central band of black hairs, hairs of the face white in the ♂, antennæ extending to about the scutellum; wings subhyaline, with a clouded apical band; abdomen shining, finely punctured, segments, especially in the ♂, impressed at the apex, in this sex the 1st and 2nd segments are clothed with long greyish white hairs, and the apical segments are fringed with similar hairs, those of the 6th being darker; in the ♀ the dorsal surface of the abdomen is nearly glabrous, the few existing hairs and the anal fringe being black, segments beneath fringed with white hairs in the ♂, with black in the ♀, legs with black hairs in both sexes, except the femora in the ♂ and the front femora in the ♀ which are fringed with white, scopæ black.

L. 11-14 mm.

Local but very widely distributed, and occurring both in Scotland and Ireland; still I have never taken it either at Woking or Chobham. Mr. Bradley tells me that a specimen of the ♂ of this species together with two females of the following species were dug up alive on the 28th of December, 1893, from a railway bank near Birmingham.

A. fulva, *Schr.* (♂ = *armata*, *Kirb.*).—Thorax above, densely clothed with bright brown hairs in both sexes, those of the ♀ nearly red, abdomen sparingly in the ♂, very densely in the ♀, clothed with similar hairs to that of the thorax, though of a very slightly paler colour; clypeus clothed with white hairs in the ♂, underside and legs with pale fulvous; face, apex of abdomen, underside and legs in the ♀ densely clothed with black hairs; mandibles in the ♂ long and falcate, with a sharp tooth exteriorly, at the base, antennæ with the third joint not quite so long as the fourth and fifth together; wings in both sexes subhyaline, propodeal area finely rugose, apical ventral segment in the ♂ truncate and testaceous at its apex; apex of the posterior tibiæ and the posterior and intermediate tarsi in the ♂, more or less testaceous, calcaria in both sexes pale.

L. 12–14 mm.

Very abundant in many localities and widely distributed, but I have no record of it from either Scotland or Ireland. It frequents Sallows and other spring flowers. The ♀ is unlike any other British bee, the ♂ could only be confounded with the *Trimmorana* var. of *rosæ* which, however, essentially differs in the simple mandibles, and fulvous haired clypeus, or with *taponica* which differs in the less brightly coloured pubescence and the shorter third joint of the antennæ, which is not nearly so long as the fourth and fifth together. Rarely stylopized.

A. Clarkella, *Kirb.*.—Black, the ♂ entirely clothed with brownish hairs, ♀ clothed with bright brown hairs on the thorax, and posterior tibiæ and tarsi, its head,

abdomen and underside densely clothed with black hairs. ♂ with a few black hairs along the margin of the eyes, mandibles rather long, simple at the base, antennæ with the third joint almost as long as the fourth and fifth together, in the ♀ much longer; wings subhyaline in both sexes, slightly clouded at the apex, abdomen in the ♂ suboval, somewhat shining, finely but indefinitely punctured, clothed with rather paler brown hairs than the thorax, the posterior margins of the segments piceous; in the ♀ very densely clothed with black hairs, sometimes with broad apical bands of pale hairs, rarely entirely clothed with brown hairs; apex of the posterior tibiæ and the posterior metatarsi in the ♂, the whole of the posterior tibiæ and metatarsi and the intermediate metatarsi in the ♀ clear testaceous.

L. 11-13 mm.

One of the very early spring bees. Mr. Frisby records its occurrence at Maidstone as early as 19th February, in the past extraordinarily early season (1893). It is very widely distributed, frequenting Sallow blossoms all over our islands, but not as a rule very abundant. The widely pale-banded varieties of the ♀ are rare. The pale apex of the posterior tibiæ will distinguish the ♂ from any of its allies. *Varians*, *helvola*, &c., which also possess this character, have the abdomen polished. Rarely stylopized.

A. nigroænea. *Kirb.* (*stylopized* ♂ = *aprilina*, *Smith*).

— Black, face densely clothed with black and brown hairs intermixed, or brown in the centre, surrounded with black, longitudinally rugose near the vertex between the eyes, cheeks and mandibles simple in both sexes, antennæ in the ♂ with the third joint short, hardly longer than the fourth, in the ♀ nearly as long as the three following together; thorax densely clothed with bright fulvous brown hairs, the colour brighter in the ♀, wings subhyaline, mesonotum rugosely but not deeply punctured, propodeum finely rugose; abdomen shining, clothed on the first four segments with

pale brown hairs, on the rest with black, the pubescence denser in the ♀ than in the ♂, and that at the apex of each segment rather paler, the extreme apex of each polished and shining, segments beneath fringed with long brown hairs, apical valve in the ♂ truncate, armature small; legs clothed with brown hairs, except the posterior pair in the ♀ which have the floccus, the hairs of the femora and the scopæ, bright fulvous.

L. 12-14 mm.

Common and generally distributed in the spring, but not one of the earliest species. Mr. Enock, Ent. Mo. Mag. xxi. p. 231, records a living example of the ♂ dug up on December 30th, 1884. It is partial to the Dandelion, but occurs on other flowers. Very like *tibialis* but the clear testaceous tibiæ and enclosed clathrate propodeal area of that species will distinguish it at once; from *rosea* var. *Trimmerana*, the fulvous scopæ of this species will separate it easily. Not unfrequently found stylized.

A. Gwynana, Kirb. (second brood = *bicolor*, Fab.).—Much smaller than any of the preceding; black, head densely clothed with black hairs, with a few paler ones on the vertex, antennæ in the ♂ with the third joint not nearly, in the ♀ about, as long as the following two together, mandibles simple in the ♂; thorax clothed above with dull brownish hairs in the ♂, with dark fulvous brown in the ♀ and black beneath in both sexes, but the colour of the ♂, especially, fades very quickly, wings slightly clouded, propodeum finely rugose; abdomen somewhat shining, finely and rather indefinitely punctured in the ♀ of both broods, somewhat indefinitely in the ♂ of the spring brood, but very distinctly in that of the autumn, apical impressions shining and impunctate, sparingly clothed with pale hairs on the first and second segments of the ♂, and with fulvous hairs on the first three segments of the ♀, with short black hairs on the rest, intermixed in the ♂ with pale ones, the hairs at the apices of the segments paler, apical fringe

brownish in the autumn brood ; segments beneath fringed with pale or sooty brown hairs in the ♂, with black, or brown in the autumn brood, in the ♀ ; legs clothed with pale brown hairs in the ♂, with black in the ♀, except the scopæ, of which the hairs are bright fulvous.

L. 9-10 mm.

Very common in the spring on Sallows and Dandelions, the second brood is not so abundant. I have taken both broods from the same bank near St. Leonards, so that I have no doubt of their identity. 'Stylopized' examples are rare ; I have one taken at Worthing on the 20th October, 1877.

A. angustior, *Kirb.*—About the same size as *Gwynana* but differing from it in having the face clothed with nearly white hairs in the ♂ and with pale fulvous in the ♀, in having the third joint of the antennæ in the ♂ as long as and in the ♀ much longer than the next two together ; in having the thorax clothed with very pale fulvous hairs, the abdomen shining with the apices of the segments testaceous, and with pale lateral fringes ; all the legs in both sexes clothed with golden hairs, posterior tibiæ and intermediate and posterior metatarsi in the ♀ more or less testaceous.

L. 9-10 mm.

Occurs in April and May. Ilfracombe, not uncommonly on *Hieracium pilosella* ; Chobham ; Woking and Bromley on *Ranunculus* ; Wandsworth ; Reigate. Wotton-under-Edge on *Allium ursinum* ; (*V. R. Perkins*). Wiltshire ; Oxfordshire ; Dartmouth ; (*R. C. L. Perkins*). Glanvilles Wootton ; Dorchester ; (*Dale*). Rugby ; (*Morice*). Shaughbridge ; (*Bignell*). Land's End ; (*Marquand*). Norfolk ; (*Bridgman*). Cheshire ; (*B. Cooke*). Colchester ; (*Harwood*). Maidstone ; (*Frisby*). Hastings.

A. apicata, *Smith (lapponica, Smith. Saund. &c. nec Zett.)*.—Black ; clothed in the ♂ with greyish brown, in the ♀ with pale brown hairs, clypeus and centre of the

face in the ♂ with white hairs, at the sides and vertex with greyish black, its mandibles produced outwardly at the base into a triangular tooth, face in the ♀ with rather sooty-brown hairs, antennæ in both sexes with the third joint very long, in the ♂ distinctly longer than the fifth, in the ♀ very narrow, considerably more than twice as long as its apical width and much longer than the following two together; mesonotum densely hairy in both sexes; abdomen rather shining in the ♂ with the first two segments, the sides and the apex clothed with long pale hairs, the remainder with short blackish ones, dull and finely punctured in the ♀, the first three segments rather densely clothed with pale hairs, the rest with brownish black; dorsal valve with a triangularly raised centre, segments beneath fringed with pale hairs in both sexes; apical ventral valve in the ♂ entire; legs clothed with pale hairs in the ♂, femora coxæ and trochanters in the ♀ with pale brown hairs, tibiæ with dark brown, scopæ paler beneath, tarsi beneath golden brown.

L. 12-15 mm.

Rare; on Sallows in early spring. Hastings and St. Leonards. Chippenham; (*R. C. L. Perkins*). Gloucestershire; (*V. R. Perkins*). Maidstone; (*Frisby*). Moffat; Bristol; (*Smith*).

The ♀ of this species closely resembles *rosæ* var *Trimmerana*, but may be known at once by the antennal characters and the triangularly raised centre of the apical dorsal valve.

This is clearly not the *lapponica* of Zett., so I have followed the Continental authors in adopting Smith's name for it.

A. præcox, Scop. (*Smithella*, Kirb. *clypeata*, Smith ♂).—Very like *apicata*, especially in the ♂ sex, only smaller. The ♂ may be distinguished from it by the shorter third joint of the antennæ, which is not quite equal in length to the fifth and scarcely longer than the fourth, by the rather

blunter and broader mandibular tooth, and the emarginate apical ventral valve of the abdomen. The ♀ may be distinguished by its usually more densely hairy abdomen, the pubescence of which is more brightly fulvous towards the base and tends more to form transverse bands, and by the shorter third joint of the antennæ, which is about equal to the second and third together.

L. 8-10 mm.

An early spring species, but apparently local. Chobham; Woking; Hastings; Canterbury. Wimbledon; Weybridge; (*Smith*). Oxford; (*R. C. L. Perkins*). Colchester; (*Harwood*). Norwich; (*Bridgman*). Maidstone; (*Frisby*). Bury St. Edmunds; (*Tuck*).

Rarely stylopized. I have one in this condition sent to me from Oxford by Mr. R. C. L. Perkins.

A. varians, *Rossi*.—Black; head in the ♂ with the vertex much produced posteriorly, especially at the lateral angles, face clothed with white hairs, vertex with fulvous, mandibles simple, third joint of the antennæ much longer than the fourth, which is slightly shorter than the fifth; ♀ with the head of normal shape, clypeus largely punctured, face clothed with black hairs, third joint of the antennæ as long as the fourth and fifth together, fourth shorter than fifth; thorax clothed in both sexes with fulvous hairs, those on its sides and underneath paler; abdomen rather shining and finely punctured in the ♂, dull, rugulose, and closely punctured in the ♀; clothed sparingly on the first two segments in the ♂ with pale hairs, with short black hairs on the rest, intermixed at the sides and on the apical segments with longer brown ones; in the ♀ with fulvous hairs on the first two and with black on the rest; segments beneath clothed with pale hairs in the ♂, with black in the ♀; apical ventral valve in the ♂ subtruncate; legs clothed with pale hairs in the ♂, with black in the ♀; floccus, and scopa beneath pale.

L. 9-11 mm.

Common in many localities in April, and widely distributed, though I have no record from Ireland. In my synopsis I had some doubt as to the respective males of this and the following species, and unfortunately reversed them, but I have since secured ♂ and ♀ from the same burrows, so I have no hesitation in correcting my mistake. Rarely stylopized.

A. helvola, Linn. (*angulosa*, Kirl., Thoms.).—Closely allied to *varians*, but differing in the ♂ by the narrower form, the less quadrate vertex, the distinct tooth at the base of the mandibles, the shorter third joint of the antennæ, which is scarcely longer than the fourth, the narrower apical ventral valve of the abdomen, and the pale apices of the posterior tibiæ.

The ♀ differs from *varians*, in the pale pubescence of the face and underside, the golden brown scopæ and piceous tibiæ, and the white or greyish-white hairs of the abdomen.

L. 9-11 mm.

Not common; I have both sexes taken in a garden at Bromley, and have the ♀ from Wandsworth, Esher, and Reigate. Mr. R. C. L. Perkins has taken it at Oxford; Norwich; (*Bridgman*). Colchester; (*Harwood*). Rugby; (*Morice*). It is doubtful to me how many of the other recorded localities belong to this and how many to the following, but I suspect that most of the more northern localities apply to *fucata*.

A. fucata, Smith.—I have at last convinced myself that this is really specifically distinct from the above. The ♂ may be known by the wider more emarginate tubercle on the labrum, the slightly larger mandibular tooth, the more glabrous abdomen, which is more polished and more finely punctured; the ♀ by the much wider, less pointed tubercle of the labrum, the more regularly and closely punctured clypeus, and by the more shining, less hairy, less rugulose, and less punctured abdomen, which has no white hairs dorsally.

L. 9-11 mm.

Chobham ; Buxton. Bury St. Edmunds ; (*Tuck*).
Norwich ; (*Bridgman*). Rugby ; (*Morice*). Oxford ;
Dartmouth ; Charlbury ; (*R. C. L. Perkins*). Colchester ;
(*Harwood*). Ardamine, co. Wexford ; Skerries, co.
Dublin ; (*H. K. G. Cuthbert*).

Although this is exceedingly like *helvola*, the form of the tubercle on the labrum is a well marked ♂ character, and the more shining surface of the abdomen and its differently coloured pubescence distinguish the ♀. It is only lately that I have had a good series of ♂ *fucata* to examine. I may say that Mr. R. C. L. Perkins has always been in favour of keeping these forms distinct, but until lately I have seen no reason for so doing.

A. nigriceps, *Kirb.* (*tridentata* ♂, *Saund. nec Kirby*).—
Black ; face clothed in the ♂ with white hairs on the clypeus with pale fulvous above it, in the ♀ entirely with black, vertex in both sexes with fulvous, ♂ with the third joint of the antennæ slightly longer than the fourth, labrum with a strong subquadrate tubercle deeply notched beneath ; thorax in both sexes clothed with bright fulvous hairs, which are redder and denser in the ♀, surface of the mesonotum and especially of the scutellum, where seen between the hairs in the ♂, shining, wings nearly hyaline, propodeum dull, finely rugulose and punctured, its basal area defined by a shining smooth line ; abdomen dull, rather strongly punctured, densely clothed with suberect pale hairs in the ♂, the hairs denser towards the apex of each segment, forming distinct pale apical bands, those towards the base subfulvous in very fresh examples, fifth and sixth with blackish hairs at the base ; ♀ with more distinct pale fulvous bands on all the segments, the hairs at the base of the third and fourth segments erect and black, apical fringe dense and black, the hairs projecting at the sides, segments beneath fringed with long white hairs in the ♂, with black in the ♀, apical ventral valve of the ♂ rather broad at the apex, sixth only

slightly reflexed; legs in the ♂ clothed with pale hairs, in the ♀ with black, floccus sooty grey, scopæ dense, black.

L. 11–12 mm.

Rare. Southwold; Bournemouth. Lowestoft; Deal; Ilfracombe; Barmouth; (*Smith*). Norwich; (*Bridgman*). Colchester; (*Harwood*). Land's End; (*Marquand*). Rock Ferry, Lancashire; (*Gardner*). Saunton, North Devon; (*Swale*).

A. simillima, *Smith*.—Very like *nigriceps*, but rather smaller, ♂ with the abdomen less pubescent and the apical bands of the segments less dense and conspicuous, ♀ differing from that of *nigriceps* in having the pubescence of the face and underside pale fulvous, and that at the base of the abdominal segments above fulvous brown not black, the hairs of the legs and scopæ brown not black.

L. 9–10 mm.

Rare. Kingsdown near Walmer; Bournemouth; (*Smith*). Ventnor; (*Rothney*). Ivybridge; (*Bignell*). Land's End; (*Marquand*). Ireland; (*Haliday*). On Bramble flowers.

The specimens before me, taken by Mr. Marquand near Penzance, are in magnificent condition, and certainly are quite distinct from *nigriceps* in the colour of the pubescence, &c.; structurally, however, the two species appear to me to be hardly distinguishable, and I suspect they will probably prove to be races of one.

A. tridentata, *Kirby* (*rufitarsis*, *Kirb.* ♀).—Closely allied to *simillima*, but differing in the following particulars:—The ♂ has the antennæ pale testaceous beneath, the hairs of the face pale fulvous, the vertex of the head produced more quadrately behind the eyes, with subprominent posterior angles, punctuation of the abdomen distinctly finer, tarsi testaceous except the basal joint; the ♀ differs from *simillima* in being smaller, in the paler colour of the pubescence even in fresh specimens, in having the flagellum of the antennæ beneath and at the apex testaceous, the abdomen less closely and regularly punctured, the apical

fimbria golden not brown, the hairs of the fifth and sixth segments adpressed, not projecting at the sides as in the two preceding; legs clothed with pale hairs, scopæ pale golden, tarsi testaceous except the basal joint.

L. 9 mm.

Very rare. Occurs on *Senecio*. Bournemouth. Norwich; (*Bridgman*). Christchurch, Hants; (*F. Smith*).

The description of the ♂ of this species in my synopsis is from a small faded *nigriceps*. This description is from a specimen taken by Smith at Bournemouth with the ♀. I have examined the type of *tridentata* in Kirby's coll., and it agrees exactly with the specimen here described.

A. fuscipes, Kirby (*pubescens*, Kirb.).—Black, head and thorax punctured, clothed with pale fulvous hairs dorsally, face and thorax beneath with paler hairs, hairs soon fading to grey in the ♂; ♂ with the joints of the antennæ, especially the subapical ones, longer in proportion to their width than in the preceding species, propodeum finely rugose, the smooth lines at the sides of the basal area scarcely indicated; abdomen more finely punctured than in either of the preceding, and clothed in both sexes with shorter less erect hairs; in the ♂ these are pale fulvous, soon fading to grey, and form distinct apical bands at the apices of the segments; in the ♀ the basal segment is clothed with erect hairs at the base, the others with very short inconspicuous semi-erect fulvous hairs, each with a distinct wide band of decumbent paler hairs at the apex, the fifth segment and the sides of the sixth densely clothed with adpressed black-brown hairs; segments beneath irregularly fringed with brownish hairs in both sexes, sixth ventral segment much reflexed at the apex in the ♂ and subemarginate, apical ventral valve narrow; legs clothed with pale hairs in the ♂, tibiæ and tarsi in the ♀ with brown, paler on the side towards the body; apices of the tarsi testaceous in both sexes.

L. 9-10 mm.

Abundant in August on the Surrey and Hampshire commons. It frequents the common heath. It does not seem however, to have a wide distribution, as the only other recorded localities I have for it are: Barmouth; Lundy; (*Smith*). Cannock Chase; (*Morice*). Norfolk; (*Bridgman*). Hastings; Lowestoft.

The strongly reflexed apex of the sixth ventral segment of the ♂, and the adpressed brown hairs of the terminal segments of the ♀ at once distinguish this species from either of the preceding.

A. denticulata, *Kirby* (*Listerella*, *Kirb.*).—Black, head and thorax clothed with very pale brownish hairs, intermixed with black on the vertex of the ♂ and on the centre of the mesonotum in both sexes; vertex shining, quadrately produced behind the eyes in the ♂, its posterior margin deeply emarginate, in the ♀ dull and of normal form, mandibles in the ♂ long and falcate, labrum with a quadrate, deeply sulcate tubercle; mesonotum somewhat dull, finely punctured except the scutellum, which is shining and remotely punctured, propodeum finely rugose, densely fringed laterally with pale hairs, its basal area more or less shining at the sides; abdomen subelliptic in both sexes, shining in the ♂, nearly dull in the ♀, basal segment thinly clothed with pale hairs, second and following segments with short erect black hairs in the ♂, subdecumbent in the ♀, the apices of the segments with a band of pale hairs, narrow in the ♂, broad in the ♀, that of the second segment interrupted in the former sex, apical fringe brown-black, segments beneath fringed with long pale hairs, ♂ with the apical valve rounded at the apex; legs piceous, clothed with pale hairs in the ♂, with pitchy-black in the ♀, the tarsi piceous, hairs of the femora pale, of the tibiae and tarsi reddish-brown, those of the tarsi brightest.

L. 9–11 mm.

A very distinct species, easily known from its allies by the black hairs on the centre of the mesonotum. It occurs

on Thistles, Bryony, *Senecio*, &c., in July and August. Chobham; Woking; Southwold; Hastings. Bournemouth; Carlisle; Southend; Sidmouth; Hele, near Ilfracombe; (*Smith*). Exeter; (*Parfitt*). Perth; (*McGregor*). Colchester; (*Harwood*).

A. fulvicrus, *Kirb.* (var. *extricata*, *Smith*).—Black, face clothed with fulvous brown hairs, surrounded by and in the male more or less intermixed with black, labrum transverse, simple, antennæ with the third joint in the ♂ about as long as the fourth and fifth together, in the ♀ as long as the fourth, fifth, and sixth; thorax clothed with brownish hairs, densely at the sides of the propodeum, mesonotum rather sparsely so, dull and somewhat closely punctured, except the scutellum, which is shining and remotely punctured, propodeum finely rugulose; abdomen slightly shining, indefinitely and rugosely punctured in the ♂, very closely and finely punctured in the ♀, first three segments in the ♂ clothed with pale greyish-brown hairs, the others with black, each segment with an apical band of paler hairs, ♀ with the segments, except the basal one, almost glabrous on the disc, each with a well-defined apical band of pale fulvous hairs, fading to white, that of the basal segment often absent, apical fringe black, segments beneath fringed at the apex with fulvous hairs; legs clothed with pale hairs in the ♂, with fulvous-brown hairs in the ♀, the scopæ bright fulvous.

L. 10–12 mm.

Generally distributed, and common in many localities. It appears in April, and sometimes again in July and August. The bands on the abdomen of the ♀ are sometimes quite white. This variety is the *extricata* of Smith, which is quite distinct from the following species.

A. fasciata, *Nyl.*—Somewhat like the preceding, but easily distinguishable by the following characters:—The pubescence of the face and of the sides and underneath of the thorax is white in both sexes, the abdomen is clothed

with longer hairs in the ♂, and the apical bands are formed of longer less decumbent hairs; in the ♀ the basal segment is more closely punctured than in *fulvicrus*, and its apical band in very fresh examples is pale fulvous, all the other bands are pure white and are composed of longer less adpressed hairs than in that species, underside with white fringes, stipites of the male armature not sinuate outwardly towards the apex as in *fulvicrus*; femora in the ♀ clothed with white hairs, tibiæ with golden fulvous hairs.

L. 10-12 mm.

Rare. Occurs in April. Hastings; Canterbury; Tunbridge Wells. Maidstone; (*Frisby*). Dovercourt; (*Harwood*). Perth; (*McGregor*).

A. ferox, *Smith*.—Black, head and thorax dull, finely and irregularly punctured, clothed with brownish hairs, which are paler in the ♂, in which sex the head is very large, sometimes exceedingly so, and the mandibles angulated, and sometimes spinose at the base outwardly, the antennæ long, with the third joint slightly shorter than the fourth, in the ♀ about equal to the fourth and fifth together; mandibles in the ♀ widely membranous beneath; wings subhyaline, nervures very pale, propodeum with the basal area somewhat shining, its sides rugulose; abdomen sparingly clothed with pale hairs, shining in the ♂, very remotely punctured, with the apex of the first and second, and sometimes the base of the second and third segments widely testaceous, dull in the ♀, with the apical margins only of the segments, paler, fringed with pale hairs at the sides, apical fringe brown, segments beneath fringed with pale hairs, base of the abdomen testaceous in the ♂; legs piceous, clothed with pale hairs, the apices of the anterior and intermediate tibiæ, the posterior tibiæ, and all the tarsi in the ♂, the posterior tibiæ and tarsi only in the ♀ clear testaceous, scopæ golden.

L. 9-12 mm.

Very rare. Bristol; (*Walcott*). Windsor; (*Desvignes*). Guestling, near Hastings; (*E. N. Bloomfield*).

A. bucephala *Steph. (longipes, Smith)*.—Allied to the preceding in the enormous head of the ♂. Black, head and thorax dull, irregularly punctured, clothed with fulvous hairs, paler on the clypeus and the sides of the thorax, cheeks slightly angulated both above and below the base of the mandibles, which are simple, antennæ unusually long in both sexes, pale beneath in the ♀, third joint in the ♂ considerably longer than the fourth, in the ♀ slightly longer than the fourth and fifth together; mesonotum finely punctured in the ♀, wings slightly dusky, nervures and tegulæ pale testaceous, propodeum finely rugose, its basal area very narrow in the ♂; abdomen shining and remotely punctured in the ♂, dull and finely rugulose, and very shallowly punctured in the ♀; elongate elliptic and with the apical margins of the segments testaceous in both sexes, very much narrowed towards the base and apex in the ♂; in the ♀ with the apices of the segments very narrowly fringed with white hairs, apical fimbria golden brown; segments beneath fringed with pale hairs, apical ventral segment in the ♂ enlarged at the apex, and deeply emarginate; legs black, clothed with pale hairs, the extreme apices of the tibiæ and all the tarsi pale in the ♂, the posterior tibiæ, and all the tarsi piceous and translucent in the ♀; tibiæ and tarsi narrower than in most of the species, which makes them look unusually long.

L. 9–12 mm.

Rare. Hampstead; Bristol; Chobham Common; (*Smith*). Birmingham; (*Marshall*). Fordlands, near Exeter; (*Parfitt*). Boxhill, at flowers of *Prunus*; (*Billups*).

A. Hattorfiana, *Fab. (Lathamana, Kirby, hæmorrhoidalis, Kirby)*.—The largest British species of the genus, black, shining, head and thorax punctured, sparingly clothed with pale hairs, which are brownish in the ♂, clypeus in the ♂ white, with its apical margin and two small discal spots black; wings smoky, propodeum finely rugose; abdomen finely punctured, shining, the apical

margins of the segments widely piceous and impressed, usually black in both sexes, but in the ♀ rarely with the first and second segments, and the apical margin of the third ferruginous red. I have never seen a coloured ♂. Second, third, and fourth segments in the ♀ with a narrow streak of white hairs at the apex laterally, apical fimbria in both sexes bright golden, segments beneath fringed with golden hairs; legs clothed with pale golden hairs, those of the scopæ long and plumose, tarsi more or less testaceous.

L. 14-16 mm.

Occurs in July and August on *Scabiosa* and *Knautia*. Between Walmer and Kingsdown; not rare. Ventnor; (*Rothney*). Erith; Darenth; Birchwood; Teignmouth and Dawlish, Devon; (*Smith*) Sidmouth; (*R. C. L. Perkins*). Ogbear, near Tavistock; (*Swale*). Land's End; (*Marquand*). Colchester; (*Harwood*). Eaton and Worsted; Norfolk; (*Bridgman*).

A. Cetii, *Schrank*. (*Schrankella*, *Kirb.*, *affinis*, *Kirb.*).—Black, head and thorax clothed above with pale greyish hairs, with nearly white beneath, ♂ with the vertex quadrately produced behind the eyes, the clypeus white, its margins and two small discal spots black, its anterior margin emarginate, with dentate lateral angles, anterior margin of the labrum rounded, filling up the emargination of the clypeus, clypeus deeply punctured in both sexes; mesonotum shining, rather finely punctured, wings nearly hyaline, propodeum very hairy, and finely rugose; abdomen subelliptic, the basal segment remotely punctured in both sexes, the rest finely punctured, pitchy black and shining in the ♂, dull and very finely and closely punctured in the ♀, all the segments in both sexes with their apical margins piceous; in the ♀, with the exception of the black basal segment, the abdomen is either entirely pale yellow or testaceous, or brown with only the apices of the segments, and sometimes the bases testaceous, segments at the apex with a more or less distinct fringe of pale hairs, apical fimbria

golden, segments beneath fringed with pale hairs, the fringes in the ♂ very regular and dense, shorter towards the middle of the segments; legs clothed with pale hairs, the tibiæ and tarsi in the ♀ with brown, scopæ brown, but the hairs of the inner side of the posterior tibiæ long and white.

L. 9-10 mm.

Local and usually rare; occurs on *Scabiosa* in July and August, Chobham. Parley Heath, Hants; Kingsdown, near Deal; Croydon; Dartford; Lewes; Coombe Martin, North Devon; (*Smith*). Sidmouth; (*R. C. L. Perkins*). Colchester; (*Harwood*). Eaton, near Norwich; (*Bridgman*).

A. cingulata, *Fab.*—Black, head and thorax sparingly clothed with whitish hairs, face with longer hairs in the ♂, in which sex the clypeus and the apices of the cheeks are white, the former with two discal black spots, antennæ ferruginous beneath, mesonotum shining, finely punctured, wings slightly dusky, propodeum finely rugose; abdomen finely and closely punctured, black, with a broad central red band, usually occupying the whole of the second and third segments, and the extreme apex of the first, sometimes, however, the apex of the third is more or less black in the centre, and the sides of the fourth more or less red, apical fringe golden in the ♂, golden brown in the ♀; hairs of the legs white in the ♂, very pale golden with a brownish tinge in the ♀, scopæ brown outwardly.

L. 8-9 mm.

A very distinct species occurring on *Veronica chamædrys* in May and June; it is far from rare, and is generally distributed.

A. albicus, *Kirb. (barbilabris, Kirby)*.—Black, head and thorax dull, largely and shallowly punctured, clothed in the ♂ with greyish hairs, except on the scutellum, where, in fresh examples, they are brown, and on the clypeus, where they are white; in the ♀ with fulvous brown hairs, wings nearly hyaline, propodeum finely rugose; abdomen

elliptic in the ♂, rather more ovate in the ♀, shining in both sexes, and clothed with rather remote long pale hairs, the apices of the segments in the ♂ very strongly depressed, smooth and impunctate, the rest of each segment remotely and shallowly punctured; in the ♀ the puncturation of the segments is so vague as to be hardly defined, and the apices of the segments are not so impressed and smooth as in the ♂; the second, third, and fourth segments in both sexes have a narrow apical band of white hairs, that of the second and third more or less interrupted, apical fringe in the ♀ brown, apices of the segments beneath pale, densely fringed with white hairs, apical valve in the ♂ rounded at the apex; legs densely clothed with silvery hairs in the ♂, with brownish hairs in the ♀, floccus white, scopæ fulvous brown, hairs of the inner side of the posterior tibiæ paler.

L. 9-11 mm.

Common in the spring, appearing in April. It is generally distributed, occurring both in Scotland and Ireland. It will burrow into the hardest paths.

A. argentata, *Smith*.—Very like a small *albicus* at first sight, the pubescence in both sexes being very similar in colour and disposition; but besides the much smaller size of the present species, it may be easily known by the somewhat shining mesonotum of the ♂, and the clear puncturation of the abdomen, which is very remote on the basal segment, but close and fine on the others; all the segments have apical bands, which are much wider than in *albicus*, and composed of longer hairs, and the surface of the segments between the bands is nearly glabrous, the band of the basal segment is very widely interrupted, and that of the second slightly so, apical fimbria in the ♀ golden-brown; scopæ pale greyish-brown.

L. 7-8 mm.

Occurs in July and August on the Surrey and Hampshire Commons, but has not been recorded from other

localities. It frequents the flowers of *Erica*. Chobham; Bournemouth. Sandhurst; Weybridge; (F. Smith). Ascot; (S. S. Saunders).

A. chrysosceles, Kirby.—Black, head and thorax finely rugulose and shallowly punctured, clothed sparingly with very pale fulvous hairs, soon fading to grey; clypeus in the ♂ white, with two round discal black spots and clothed with long white hairs, face wide and transverse in both sexes; wings with a yellowish tinge, nervures pale testaceous, propodeum finely rugose; abdomen shining, finely and closely punctured, the basal segment more remotely, the second, third, and fourth segments with an apical band of white hairs at the sides, that of the fourth entire in the ♀, in which sex all the bands are wider and more conspicuous, in the ♂ they are exceedingly narrow, apical fringe in both sexes golden, segments beneath clothed in the ♂ with long pale hairs, and the apices of the third, fourth, and fifth densely fringed with shorter golden hairs, in the ♀ the segments are fringed with long hairs; legs clothed with pale hairs, all the tarsi in both sexes, and the posterior tibiae, clear testaceous, the latter in the ♂ with a dark central spot or band.

L. 9-10 mm.

Local; occurs on *Umbelliferae*, and appears in May. Chobham; Reigate; Hampstead; Worthing; Hastings. Bury St. Edmunds; (Tuck). Colchester; (Harwood). Rugby; (Morice). Norfolk; (Bridgman). Wotton-under-Edge; (V. R. Perkins). Oxford; (R. C. L. Perkins). Glanvilles Wootton; (Dale).

A. analis, Panz.—Deep black, shining; head and thorax punctured, clothed with greyish hairs intermixed with black above, with white beneath; clypeus in the ♂ white, its margins and two discal spots black, face at the sides of the clypeus black, third joint of the antennae in the ♂ as long as the following two together, in the ♀ as long as the following three; mesonotum very

shining, wings slightly dusky, propodeum finely rugose, densely fringed at the sides in the ♀ with white hairs; abdomen finely punctured, shining, especially in the ♂, clothed in both sexes with very short semi-erect black hairs, apices of the segments deeply impressed, impunctate in the ♂, first, second, third, and fourth in the ♀ with an apical line of white pubescence, often rubbed off, these are sometimes more or less indicated in the ♂, apical fringe in the ♀ golden brown, segments beneath fringed with long pale hairs in both sexes; legs clothed with pale hairs, flocus and hairs of the femora white, posterior tarsi in both sexes and posterior tibiæ in the ♀ clear testaceous.

L. 8-9 mm.

Common in some localities, especially in the North. Chobham; Woking; June to August, usually on flowers of *Potentilla tormentilla*. Berwickshire; Wakefield; Weybridge; Ireland; (*Smith*). Northumberland; (*Bold*). Lancashire; (*Gardner*). Hastings; Parley Heath; (*Dale*).

A. Coitana, Kirby (*Shawella*, Kirby).—Black, shining, except the head in both sexes, and the thorax in the ♀ which are dull, head clothed with brownish grey hairs, orbital impressions in the ♀ filled with bright golden brown pubescence, very conspicuous in certain lights, clypeus, and the apices of the cheeks at its sides, white in the ♂, and clothed with white hairs, antennæ more or less piceous beneath in both sexes, the third joint slightly longer than the next two together; mesonotum including the scutellum in the ♂ very shining and remotely punctured, the interstices quite smooth, dull and rather closely punctured in the ♀; wings slightly smoky, propodeum finely rugose; abdomen shining, elliptic and narrow at the base in the ♀, segments very slightly impressed at the apex, finely punctured at the base, clothed in the ♂ with short erect, blackish hairs, second and third segments in both sexes with a lateral line of white pubescence at the apex, and the fourth with an entire narrow band,

apical fimbria in the ♂ pale golden, in the ♀ golden brown, segments beneath fringed with long pale hairs, legs entirely black, clothed with pale hairs, those of the scopæ of the ♀ with a brownish tinge.

L. 8-9 mm.

Not rare; on bramble flowers, July and August. Chobham; Lowestoft; Southwold; Littlehampton; Bourne-mouth. Yorkshire; Cumberland; Walmer; Cromer; (Smith). Colchester; (Harwood). Rugby; (Morice). Exeter; (Parfitt). Land's End; (Marquand). Norfolk; (Bridgman). Gloucester; (Perkins). Perth; (Mc Gregor).

A. lucens, *Imhoff*.—Very like *Coitana* in general appearance, but easily distinguished by the following characters:—

♂ with the clypeus black, head and thorax, especially the face, much more hairy, mesonotum less shining, very finely rugulose, the scutellum nearly impunctate, abdomen slightly more ovate and convex, segments beneath clothed with short pale hairs and very densely fringed at the apex with short, somewhat curved golden hairs, shortest near the middle of the segments; tarsi clear testaceous.

♀ with the head wider than in *Coitana*, face clothed with pale hairs, pubescence of the orbital impressions inconspicuous, mesonotum less closely punctured, the scutellum almost impunctate, or with only a few very remote punctures; abdomen wider at the base, subovate, the sides of the second segment subparallel, not diverging to the apex as in *Coitana*, white apical bands rather more pronounced, apical fimbria golden, legs clothed with pale hairs, scopæ pale whitish.

L. 8-9 mm.

Rare. Chobham, on the Common, the ♂ flying about over the heather, the ♀ at bramble flowers in a hedge close by. Shipley, near Horsham; (Gorham). Bramble flowers, Boxhill; (Ramsden).

A. fulvago, *Christ. (constricta, Smith)*.—Black, shining, head and thorax punctured, clothed with fulvous hairs; face in the ♂ clothed with long fulvous hairs, in the ♀ with short; antennæ in the ♂ with the third joint scarcely longer than the fourth, each joint of the flagellum in front with a narrow basal band of grey pubescence, ♀ with the third joint not quite so long as the two following together; wings slightly dusky, propodeum finely rugose; abdomen subovate, basal segment in the ♂ sometimes with a slight apical constriction, deeply and rather largely punctured, sides, and a line at the apex of the segments clothed with pale fulvous hairs, apical fringe in both sexes bright golden, apices of the segments more or less testaceous and impunctate, segments fringed beneath with golden hairs; legs clothed with pale hairs; intermediate tarsi and posterior tibiæ and tarsi clear testaceous, scopæ of ♀ bright golden, the hairs long and plumose.

L. 9–10 mm.

Not common; occurs in June, July and August. Chobham; Hastings. Freshwater, Isle of Wight; (*F. S. Saunders*); Weybridge; Blackwater; Bristol; (*Smith*). Barham; (*Kirby*). Dartmouth; (*R. C. L. Perkins*). Plymouth; (*Bignell*). Exeter; (*Parfitt*). Yorkshire.

A. polita, *Smith*.—Black; head and thorax clothed with fulvous pubescence, which is paler in the ♂, in which sex the clypeus is clothed with white hairs, and the third joint of the antennæ is considerably longer than the fourth, the fourth being slightly shorter than the fifth, the ♀ has the third joint as long as the fourth and fifth together; mesonotum finely and distinctly punctured in the ♂, very finely so in the ♀, wings subhyaline, clouded towards the apex, tegulæ testaceous; abdomen shining, oblong ovate, finely and distinctly punctured in the ♂, rather closely so in the ♀, apices of the segments in both sexes impressed and more or less testaceous, especially in the ♂, second, third, and fourth segments with a narrow fringe of pale

fulvous hairs, more or less interrupted in the middle, beneath fringed with long fulvous hairs; legs clothed with pale fulvous hairs, scopæ bright fulvous, tarsi testaceous.

L. 10-12 mm.

Taken by Mr. F. Smith in the chalk pits at Northfleet in July, there is no other record of its capture in Britain; it is easily distinguished by the close, fine puncturation of the abdomen. Dr. Mason has kindly lent me the typical examples to examine.

A. humilis, *Imhoff*. (*fulvescens*, *Smith*).—Black, dull, with the surface finely rugulose except at the apices of the abdominal segments in the ♂; head and thorax clothed with dull fulvous hairs, those on the clypeus and under-side of the ♂ white, clypeus of the ♂ white with two small black discal spots, second joint of the antennæ in both sexes about as long as the two following together, fourth rather shorter than the fifth; mesonotum rugosely punctured, wings nearly hyaline, nervures pale, propodeum finely rugulose, with long lateral hairs; abdomen densely and rugosely punctured, clothed with erect pale hairs in the ♂, almost naked on the disc in the ♀, apices of the segments obscurely piceous, and impressed in both sexes, smooth and impunctate in the ♂, finely rugulose and sparsely punctured in the ♀, apical fringe and sides of the abdomen clothed with pale golden hairs, beneath clothed with long pale hairs; legs black, clothed with pale golden hairs, scopæ golden, calcaria pale.

L. 9-10 mm.

Local, but common in some localities. Woking; Chobham; Bournemouth; Worthing; Reigate. Freshwater, Isle of Wight; (*F. S. Saunders*). Hampstead; Blackwater, Hants; Tunbridge Wells; Hastings; (*Smith*). Oxford; (*R. C. L. Perkins*). Plymouth; Exeter; (*Parfitt*). Land's End; (*Marquand*). Gloucestershire; (*V. R. Perkins*). Lancashire; (*Gardner*). Maidstone; (*Frisby*).

A. labialis, *Kirb.* (*separata*, *Sm.* = *stylopized* ♂).—Black, somewhat dull; head and thorax punctured, finely in the ♂, more coarsely in the ♀, clothed in both sexes with greyish fulvous hairs, which are rather brighter in the ♀, clypeus in the ♂ and cheeks at its sides extending about half way up the eye, white, the former with the usual discal spots; third joint of the antennæ not quite so long as the following two together in the ♂, of the following three in the ♀, in which sex the pubescence of the orbital impressions is very conspicuous; wings slightly dusky, clouded at the apex, nervures testaceous, propodeum with a distinctly enclosed, clathrate, basal area, much as in the earliest species of the genus, its sides rugulose and hairy; abdomen slightly shining, densely clothed with very short, erect, pale hairs, very closely punctured all over the segments, their apices scarcely impressed, basal segment more remotely and largely punctured, second, third, and fourth segments with short lateral bands of pale hairs at the apex, apical fimbria golden, beneath densely punctured, clothed with pale hairs, fifth segment in the ♂ very densely fringed, apical ventral valve longitudinally curved, and looked at sideways, bilobed, the shorter, wider lobe ventral, the longer, narrower one recurved dorsally, legs with pale, golden hairs, scopæ golden, tarsi testaceous at the apex.

L. 11–14 mm.

Common in many places. Woking; Chobham; Hastings; Deal; Reigate; Worthing and Dover; Bromley. Bournemouth; Isle of Wight; Eastbourne; (*Smith*). Bury St. Edmunds; (*Tuck*). Colchester; (*Harwood*) Norfolk; (*Bridgman*). Maidstone; Southend; (*Frisby*). Gloucestershire; (*Perkins*). Cornwall (*Swale*).

A. minutula, *Kirby* (*parvula*, *Kirb.* = *spring brood*).—Small, black, head and thorax dull, finely rugulose and punctured, sparingly clothed with pale hairs, face in the ♂ of the spring brood with longer black hairs, third joint of the antennæ in the ♂ longer than the fourth, but very

little longer than the fifth, joints of the flagellum distinctly broader than long, third in the ♀ not quite equal to the fourth and fifth together; wings nearly hyaline, nervures dark piceous, propodeum finely rugose, more distinctly so on the basal area; abdomen finely rugulose, not distinctly punctured, or sometimes in the ♂ finely punctured at the base of the segments, apices of the segments in the ♂ slightly impressed, smooth and shining, in the ♀ rather less rugulose, and more shining than the basal portion, both sexes with a line of white pubescence at the apex of the second, third and fourth segments laterally, apical fringe silvery golden in the ♂, golden brown in the ♀, beneath clothed with pale hairs; legs clothed with pale, greyish silvery hairs, scopæ silvery, with a brownish tinge.

L. $5\frac{1}{2}$ –7 mm.

Common, and generally distributed, the first brood appearing in April and the second in July; these used to be considered as constituting distinct species, but the characters are only such as occur in some of the other double brooded species.

A. nana, Kirby.—Like the preceding in size and colour, but distinguishable by the following characters, although often far from easy to recognize.

♂ with the antennæ longer, the joints of the flagellum as long as, or longer than wide, the mesonotum rather less closely punctured, the abdomen distinctly so, its puncturation clear and well defined, the stipites of the armature are also wider at the apex.

♀ with the antennæ more or less piceous beneath, the mesonotum rather less rugulose, the abdomen distinctly punctured, as in the ♂, the white pubescent bands denser, and more conspicuous.

L. $5\frac{1}{2}$ –7 mm.

Common, and generally distributed. Often occurs stylopized.

A. proxima, Kirby (*Collinsonana*, Kirby, *digitalis*, Kirby).—Black, head and thorax dull, finely rugulose, and rather closely punctured, the puncturation larger in the ♀, clothed with greyish brown hairs, which are rather deeper in colour in the ♀, third joint of the antennæ in the ♂ about equal in length to the fourth, in the ♀ rather shorter than the fourth and fifth together; wings rather dusky, propodeum somewhat clathrately rugose, and clothed with long hairs, basal area ill defined; abdomen shining in the ♂ almost smooth, finely and very remotely punctured, in the ♀ exceedingly finely rugulose, with a very shallow, fine, scarcely noticeable puncturation, apices of the segments widely impressed, and impunctate in both sexes, sides of the second, third, and fourth segments with short apical bands of white hairs, sixth and seventh in the ♂ clothed with white hairs, fifth and sixth in the ♀ with golden hairs, beneath punctured, segments pale at the apex, and fringed with long hairs; legs black, clothed with pale hairs, scopæ silvery, with a slight brownish tinge, tarsi piceous at the apex.

L. 9–10 mm.

Very rare. Occurs in June. Weybridge; Blackwater, Hants; Hastings; Bristol; (*Smith*). Sidmouth; (*Parfitt*). Norfolk; (*Bridgman*); Land's End; (*Marquand*).

A. dorsata, Kirby (*combinata*, Kirby, *nudiuscula*, Kirby? *Lewinella*, Kirby? *connectens*, Kirby?).—Black, head and thorax dull, finely rugulose, punctured, clothed with bright fulvous hairs above, especially on the post scutellum, with paler hairs on the face and beneath. Antennæ in the ♂ with the third joint short, hardly longer than its apical width; wings slightly clouded at the apex, nervures pale, testaceous; propodeum rugose; its basal area well defined, its sides, especially in the ♀, each with a dense tuft of pale, fulvous hairs; abdomen shining, finely rugulose in the ♀, scarcely so in the ♂, very closely punctured, clothed in the ♂ with pale hairs, more or

less intermixed with darker ones on the third and fourth, and base of the fifth, apex of the fifth, the sixth and seventh, with pale, fulvous hairs; in the ♀ almost glabrous, basal segment with a few fulvous hairs laterally, apices of the segments in both sexes pale, that of the second, third, and fourth with a streak of white or pale fulvous hairs on each side, those on the fourth uniting into a complete band in the ♀, apical fringe golden brown, beneath punctured, clothed with pale hairs; legs clothed with pale fulvous hairs, posterior tarsi in both broods, and all the tarsi in the ♂, and the apices of the posterior tibiae in both sexes of the autumn brood, clear testaceous, the pale colour in the ♀ sometimes extending over nearly the whole joint, scopæ pale golden brown, with silvery reflections.

L. 9–11 mm.

Local; on Sallows in spring, and flowers of Blackberry and Bryony in July and August. Woking; Chobham; Southwold; Bournemouth. Colchester; (*Harwood*). Norwich; (*Bridgman*). Sidmouth; (*R. C. L. Perkins*). Exeter; (*Parfitt*).

A. similis, *Smith (Wilkella, Saund. Syn. nec Kirby)*.—

Much more robust than the preceding, black, head and thorax closely punctured, densely clothed with rich, fulvous hairs above, face and underside with white hairs, third joint of the antennæ in the ♂ slightly longer than the fourth; wings slightly clouded, nervures pale, post scutellum densely clothed with rich, fulvous hairs like those of the mesonotum, propodeum finely rugose, its sides clothed with pale fulvous hairs; abdomen slightly shining, ovate, finely rugulose, closely and distinctly punctured in the ♂, very finely and shallowly punctured in the ♀, clothed in the ♂, with pale hairs on the basal segments, and with very short, inconspicuous dark hairs on the others, in the ♀ nearly glabrous, second, third and fourth segments with a lateral apical band of white hairs, con-

spicuous in the ♀, but hardly noticeable in the ♂, apical fringe golden, segments beneath fringed with white hairs; legs clothed with pale hairs, the apex and sometimes the base of the posterior tibiæ and the posterior tarsi testaceous in the ♂, posterior tibiæ and tarsi and intermediate tarsi bright testaceous in the ♀, scopæ golden.

L. 9-12 mm.

Woking; Chobham; Wandsworth. Bristol; (*Walcott*). Hampstead; (*Enock*). Oxford; Moreton Hampstead; (*lt. C. L. Perkins*). Colchester; (*Harwood*). Near Ruthin, Denbighshire; (*Gardner*).

A. Wilkella, Kirby (*xanthura*, Kirby; *Afzeliella*, pars *Saund. Syn. Smith, &c.*).—Very like the preceding, but much less bright in the colour of its pubescence, that of the head and thorax being dull brownish; antennæ in the ♂ with the third joint shorter than the fourth; the face in both sexes is clothed with very pale brown, not white hairs, and the cheeks beneath, as well as the underside of the thorax are clothed with very pale hairs in the ♀, with white in the ♂, and unlike *similis*, the post scutellum in both sexes is almost hairless, wings slightly clouded; the abdomen is duller, and more distinctly punctured throughout in the ♀ than in *similis*, and with more abundant pale pubescence, and more closely and strongly punctured in the ♂, in which sex there is a conspicuous lateral band of pale hairs on the apex of the second and third segments, and an entire band on the fourth, in the ♀ the lateral bands are rather longer, very pale fulvous in fresh examples, soon fading to white, fourth with an entire band, apical fringe pale golden; legs clothed with pale hairs, posterior tibiæ and tarsi in the ♀, and sometimes the apex of the posterior tibiæ and tarsi in the ♂ testaceous; scopæ golden.

L. 8-10 mm.

Common, and generally distributed; appears in May and June; it is very liable to be confounded with *Afzeliella*, the distinctive characters of which will be found under that name.

A. Afzeliella, Kirby (var. *fuscata*, Kirby; var. *stylop. convexiuscula*, Kirby; race? = *intermedia*, Thoms.).—So like the preceding that its distinguishing characters only need be pointed out.

♂ with the antennæ shorter, the face clothed with long brown hairs, or if with short pale ones as in the race *intermedia*, then with the third and fourth joints of the antennæ subequal in length, cheeks beneath, and underside of thorax with fulvous, not white hairs; abdomen punctured as in *Wilkella*, but in race *intermedia*, rather more shining.

♀ wings with no yellowish tinge, as in *Wilkella*, disc of the basal abdominal segment indistinctly punctured, or impunctate, whereas in *Wilkella* it is distinctly so, apical fringe dusky, or, if pale, as in race *intermedia*, then with the abdomen rather more shining; tibiæ as in *Wilkella*, but occasionally entirely dark (var. *fuscata*, Kirby.).

L. 8–10 mm.

An early spring bee, appearing in April, and sometimes again in August, common and generally distributed; its relationship to *Wilkella* is very close; but the differences given above, which were originally pointed out by Mr. R. C. L. Perkins, Ent. Mo. Mag. xxv. p. 128, though slight, appear to be constant. *Convexiuscula*, Kirby., is a stylopized form, commonly met with; but it probably includes stylopized examples, both of this and the preceding species; and in such closely allied forms the effects of stylopization render it unsafe to speak with certainty as to the specific identity of an affected specimen.

MACROPIS, Panz.

There is only one British species of this genus, which is quite unlike any other of our Hymenoptera. The genus may be thus characterized.

Labial palpi four-jointed, its points cylindrical, maxillary palpi six-jointed, tongue short ovate, apiculate, labrum

transverse, anterior wings with two submarginal cells, abdomen short, black, shining, both sexes with a well-defined pygidial area, posterior femora and tibiæ dilated in the ♂, posterior tibiæ and metatarsi dilated and densely hairy in the ♀, floccus absent.

M. labiata, *Fabr.*—Black, head and thorax closely and largely punctured, clothed with brownish hairs, disk of the latter in the ♀ with short blackish hairs; face of the ♂ white below the antennæ, which are rather long, testaceous beneath, and reach to about the middle of the propodeum, a spot on the scape occasionally, and another near the base of the mandibles white; antennæ in the ♀ short; wings slightly smoky, propodeum coarsely rugose at the base; abdomen very shining, subelliptic, shorter in the ♀, basal segment in the ♂ largely and remotely punctured, the rest more finely so, in the ♀ the punctures of the basal segment are very shallow, and those of the other segments fine, third and fourth segments in both sexes and the fifth in the ♂ with an apical band of snow white hairs, that on the third more or less interrupted, apical fringe of the ♀ black, beneath with the third, fourth and fifth segments in the ♂, and the second, third, and fourth in the ♀ fringed with golden hairs, the fifth and sixth in the latter sex with brown, seventh in the ♂ tuberculate at each side, with thick lateral hairs, eighth produced at the apex into a shield-shaped process with a long central point, and clothed with long hairs, armature looked at from above subquadrate, the stipites produced into two long flattened processes, legs in the ♂ clothed with pale hairs, tarsi piceous, very short, posterior femora swollen, punctured, tibiæ dilated, the outer margin curved, the lower somewhat produced near the apex, and then slightly sinuate; in the ♀ clothed with brown hairs, scopæ dense, yellowish white, posterior metatarsi dilated, densely clothed with black hairs, tarsi piceous at the apex.

L. 9-10 mm.

The only localities known for this species are Norwich; (*Bridgman*). New Forest; (*J. Walton*). Weybridge, 1842; (*Stevens*); and Woking; in this last locality, where it was first discovered by Mr. F. Enock, frequenting the flowers of *Lysimachia vulgaris* along the canal, it is annually to be found in August. It also occurs occasionally on thistles.

CILISSA, Leach.

Very like *Andrena*, but with the abdomen less flattened, and rather wider and more declivous at the base; labial palpi four-jointed, the joints cylindrical, maxillary palpi six-jointed, paraglossæ wide and sheath-like at the base, apical processes narrower, obtuse at the apex and ciliated with long hairs, tongue very pointed, the hairs towards the apex projecting at right angles and bifid; labrum transverse, apical joint of the antennæ obliquely truncate, wings with three submarginal cells; ♀ without distinct floccus, and with the posterior metatarsus produced at the apex, both sexes with a distinct tibial patella; armature with the apices of the stipites not convergent as in *Andrena*, seventh segment tuberculate at the sides apically. F. Smith says that the economy of this genus is similar to that of *Andrena*, but the species are not common, and I have never seen them except away from the burrows. This appears to be a genus of small extent; there are two British species which may be thus distinguished.

- | | | | |
|-----|----|---|------------------------|
| (2) | 1. | ♂, abdomen without distinct pale apical bands on the segments; ♀, apical fringe golden. | <i>HÆMORRHODALIS</i> . |
| (1) | 2. | ♂, abdomen distinctly banded; ♀, apical fringe black-brown. | <i>LEPORINA</i> . |

C. hæmorrhoidalis, *Fab.* (*chrysura*, *Kirby*).—Black, head and thorax punctured, clothed with brownish grey hairs, those of the vertex and of the disc of the mesonotum in both sexes black, pubescence in the ♂ paler, longer, and more abundant, joints of the flagellum in the ♂ very

arcuate beneath, in the ♀ simple, both sexes with the apical joint diagonally truncate; wings nearly hyaline, nervures dark piceous, propodeum finely rugose; abdomen suboval ♂, subcordate ♀, distinctly and deeply punctured in the ♂, the apices of the segments narrowly shining and impunctate, very closely and finely punctured all over in the ♀, clothed in the ♂ with long pale hairs, intermixed with black on the third and following segments, sixth segment clothed with pale golden hairs, ♀ with the basal segment clothed with longer pale hairs, the second, third, and fourth with exceedingly short dark ones, and each with a narrow apical line of white pubescence, apical fimbria bright fulvous golden, beneath clothed with pale hairs, those of the ♀ more or less fulvous; legs clothed with pale hairs, those of the intermediate and posterior tibiæ and tarsi, golden in the ♀ outwardly, tarsi beneath with black hairs, apices of the tarsi in both sexes testaceous.

L. 12-15 mm.

Widely distributed but not common, occurs in July and August, frequenting the common harebell. Woking; Chobham. Shirley; Kingsdown, near Deal; Weybridge; Bournemouth; Bath; Bristol; North Devon; (*Smith*). Norfolk; (*Bridgman*). Wotton-under-Edge; (*V. R. Perkins*). Sidmouth; (*R. C. L. Perkins*). Perth; (*McGregor*).

C. leporina, *Panz.* (*tricincta*, *Kirby*).—Black, head and thorax finely punctured, clothed with pale ochraceous hairs, intermixed with black on the vertex and mesonotum, and with white on the underside, antennæ more or less piceous beneath, the joints of the flagellum simple in the ♂, the terminal joints in both sexes obliquely truncate; wings hyaline, the nervures piceous, propodeum finely rugose, its basal area in the ♀ nearly smooth, though dull; abdomen rather finely though rugosely punctured, first and second segments in both sexes clothed with pale hairs, the rest with black, each segment with a well defined apical band of pale hairs, the fifth with a lateral pale tuft in the ♀, terminal

fringe black, the pubescence in the ♀ shorter than in the ♂, segments beneath fringed with pale hairs; legs clothed with pale hairs, scopæ of ♀ golden grey, metatarsi beneath with fulvous golden hairs.

L. 12-14 mm.

Occurs in July and August. It is not common, but is rather widely distributed. Chobham; Woking; Hayling Island; Littlehampton; Deal; Hastings; Southwold; Ilfracombe; Bournemouth. Hampstead; Gravesend; Erith; (*Smith*). Bickleigh, Devon, (*Bignell*). Norfolk; (*Bridgman*). Colchester; (*Harwood*).

DASYPODA, Latr.

Very like *Andrena* in form, but easily recognized by the absence of the third submarginal cell of the wings, and by the enormous scopæ of the ♀; labial palpi four-jointed, the joints cylindrical, maxillary palpi six-jointed, tongue somewhat elongate, lanceolate, paraglossæ with the outer margins of their basal portion emarginate, apical process short and narrow, lora long and very strongly developed, submentum elongate, labrum transverse, antennæ simple; abdomen andreniform, armature of the ♂ with the stipites not convergent, seventh ventral segment produced at the apical angles into a narrow transverse process on each side; tibiæ without a patella in either sex. There is only one British species of the genus which makes its burrows in sandy places.

D. hirtipes, Latr. (*Swammerdamella*, Kirby).—Black, head and thorax clothed with pale yellowish fulvous hairs above, with paler hairs beneath, which are almost white in the ♂, vertex and an indistinct band across the mesonotum in the ♀ with black, clypeus in the ♂ with white; antennæ in the ♀ more or less piceous; mesonotum punctured, wings nearly hyaline, propodeum somewhat shining, largely

punctured and clothed with long hairs; abdomen shining, largely punctured ♂, more finely ♀, first three segments in the ♂ nearly entirely clothed with long pale hairs, the rest with black, the fourth, fifth, and sixth with a pale apical band, basal segment in the ♀ clothed with pale hairs, all the rest with black, the second, third, and fourth with a subapical band of white hairs, that of the second and third narrowly interrupted in the centre, fifth and sixth densely clothed with erect black hairs, all the segments narrowly smooth and piceous at the apex, segments beneath clothed in the ♂ with pale hairs, the fifth with black, the sixth nearly glabrous, in the ♀ the segments fringed with sooty black hairs; legs in the ♂ clothed with long pale hairs, tarsi beneath with bright fulvous, anterior legs in the ♀ clothed with dark hairs in front and pale behind, intermediate with brown, posterior with fulvous, those of the tibiæ and metatarsi of the last extremely long, beautifully branched, and bright golden fulvous, apices of the tarsi testaceous.

L. 15-16 mm.

This very handsome insect appears in July and August, and in some sandy localities is far from uncommon. It has been recorded from Yarmouth and places along our east and south coasts, westward to Land's End, occurring again at Braunton, Barmouth, and in Cheshire and Lancashire. I take it occasionally at Woking and Chobham, and F. Smith quotes Charlton and Paul's Cray, Kent, as localities for it. Mr. Harwood takes it at Colchester, but it is recorded from very few inland localities.

PANURGUS, Panz.

This is a genus of coal-black bees, of which we have two British representatives, they are distinctly *Andreniform*, and resemble *Andrena* also in habits; labial palpi four-jointed, the joints cylindrical, the basal joint

much longer than any of the others, second and third joints subequal, maxillary palpi six-jointed, paraglossæ narrow, their blades gradually narrowed to the apex, which is acute, tongue elongate, about eight times as long as its width, lora not definite, the arch which represents them being apparently formed of the thickened apex of the membrane between the cardines, submentum subglobular, hyaline, antennæ in the ♂ scarcely longer than in the ♀; wings with the marginal cell subtruncate at the apex, and appendiculated, two submarginal cells. ♂ with eight ventral segments exposed, the eighth narrow and andreniform, genital armature very variable in shape, and affording good specific characters; posterior tibiæ in both sexes with a basal patella; ♀ with a distinct apical fringe, and well developed tibial scopæ; metatarsi produced at the apex outwardly. Our two species may be thus distinguished:—

- | | | | |
|-----|----|--|-------------|
| (2) | 1. | Smaller, ♂ with a large blunt spine on the posterior femora beneath; ♀ with the surface of the abdomen nearly glabrous . . . | CALCARATUS. |
| (1) | 2. | Larger, ♂ posterior femora simple; ♀, abdomen above clothed with erect hairs . . . | URSINUS. |

P. calcaratus, Scop.—Black, shining, sparingly clothed with erect black hairs intermixed with grey, head in the ♂ often very large; antennæ more or less testaceous towards the apex in both sexes, rarely entirely black, clypeus deeply emarginate in front, especially in the ♂, labrum highly polished, and centrally impressed; mesonotum finely, remotely, and irregularly punctured, propodeum shining, impunctate, its basal area impressed, longitudinally striate; abdomen very finely punctured, its dorsal surface sparingly clothed with black hairs in the ♂, nearly glabrous in the ♀, apices of the segments deeply impressed in the ♂, slightly in the ♀, in both sexes subpiceous, apical fringe sooty brown, sixth segment in the ♀ narrowly raised in the centre; segments beneath fringed with hairs at the apex, the sixth in the ♂ narrowly emarginate in the centre,

the seventh scarcely visible, the eighth produced, narrow, and slightly widened at the apex, armature with the stipites very large at the base, and longer than the narrow apical processes, which bear a narrow tuft of hairs projecting on their external side, sagittæ divergent, angularly produced laterally; legs clothed with pale hairs in the ♂, with sooty hairs in the ♀, posterior femora in the ♂ with a large truncate spine beneath, posterior tibiæ curved, thickened at the apex, with a tuft of long hairs on their inner margin, coxæ simple, scopæ of the ♀ greyish brown (although often covered with bright yellow pollen).

L. 7-8 mm.

Burrows in the ground, generally in sandy or gravelly places, the males often spend the night curled up in composite flowers; abundant in some places, occurring in July and August; Chobham; Woking; Hastings; Bournemouth. Blackheath, Isle of Wight; (*Smith*). Sidmouth; (*R. C. L. Perkins*). Land's End; (*Marquand*). Devonshire; (*Parfitt*). Croydon; (*Marshall*).

P. ursinus, *Gmel.* (*Banksianus*, *Kirby*).—Rather larger than the preceding, black clothed with black hairs, head in both sexes densely hairy, in the ♂ scarcely wider than the thorax, antennæ black; mesonotum shining, finely and remotely punctured, sparsely hairy, propodeum shining, impunctate, its basal area impressed, but not clearly defined, posteriorly with a deep oblong fovea; abdomen shining, clothed with black hairs in the ♂, with finer, brown hairs in the ♀, segments with the apical impressions deep, glabrous, and piceous, apical fringe sooty black in the ♂, brown in the ♀; beneath with the segments fringed at the sides with black hairs in the ♂, in the ♀ the fringes of the segments are brown and entire, sixth segment in the ♂ deeply emarginate, seventh impressed along the centre, slightly emarginate at the apex, eighth narrow, parallel-sided, hairy, its apex truncately rounded, armature testaceous, with the stipites wide at the base, produced at the apex on

each side, into a narrow process, sagittæ longer than the stipites, concave, divergent, and each terminating in a blunt, somewhat spoon-shaped process; legs clothed with fulvous hairs, coxæ and femora simple, posterior tibiæ and metatarsi in the ♀ testaceous, scopæ bright golden, tarsi testaceous at the apex.

L. 9–10 mm.

Abundant in some localities, occurs in July and August, Chobham; Woking; Hastings; Ilfracombe. London District; Bournemouth; Budleigh Salterton; Sidmouth, Barmouth; (*Smith*). Morthoe, N. Devon; (*Swale*). Land's End; (*Marquand*). Norwich; (*Bridgman*). Edgbaston; Ramsgate; (*Marshall*).

DUFOUREA, Lep.

Like a small *Panurgus*, but having the ♂ much narrower than the ♀, with longer antennæ and almost Halictiform; the marginal cell of the wing also is elongate and pointed, not truncate at the apex as in *Panurgus*, and without appendix; first six ventral segments, and the apex of the eighth visible in the ♂; sixth dorsal segment in the ♀ with a well defined dorsal area; tibiæ with a patella, scopæ small, metatarsi not produced apically. There is only one British species of this genus, of which only three specimens, two males and a female, have occurred; nothing is known of its habits.

D. vulgaris, *Schenck*.—Black, shining, head and thorax clothed with ochreous hairs, which are longer, and more abundant in the ♂, head deeply punctured, clypeus largely so, especially in the ♀, second, third, and fourth joints of the antennæ in the ♂ subequal, second in the ♀ subglobular, the following four very short, and widely transverse; mesonotum very shining, exceedingly remotely and finely punctured, wings slightly smoky, propodeum with its basal area semicircularly defined, finely and longitudi-

nally rugose; abdomen shining, sparingly clothed with pale hairs, intermixed with black on the apical segments, very remotely and finely punctured, especially in the ♀, the apices of the segments impressed, piceous, and impunctate in both sexes, apical fringe brown, apical dorsal valve pale at the apex in the ♂, more or less piceous in the ♀, the pygidial area flat, beneath shining, in the ♂ with a few short dark hairs, in the ♀ with the margins of the segments pale, and fringed with brown hairs, fifth with a transverse carina, seventh segment in the ♂ with two apical hairy lobes, eighth very narrow, truncate at the apex, genital armature with the stipites ending in a pointed process, sagittæ widely distant, with their apices pointed, legs clothed with pale hairs, scopæ of ♀ very inconspicuous, silvery gray.

L. 6-7 mm.

One ♂ Undercliff, Chewton, Hants, 12th Aug., 1879 (*S. S. Saunders*). One ♀, Woking, 1st Aug., 1881, (*Billups*, who has kindly presented the specimen to me), and one ♂, Chobham, 1st Aug., 1891, taken by myself. These are the only three recorded captures of this little insect in Britain; either sex might be passed over for a black *Halictus*, but the want of the third sub-marginal cell will detect it. Its flight also is different, it "wiggles" into a flower. Although I only saw the ♂ I caught for a second before it settled, I knew by its wriggling flight that I had got something good, and suspected *Dufourea* at once. It must be an exceedingly scarce insect, as I have looked for it carefully in my neighbourhood every year since 1881, and have only seen this one ♂.

ROPHITES, Spin.

Species dull and pubescent, *Halictiform*, especially in the comparative forms of the ♂ and ♀, the ♂ being clon-

gate, with long antennæ, and the ♀ short, with short antennæ; the tongue is very elongate, the lora are elongate, and very strongly developed, labial palpi four-jointed, the three lower joints sheath-like, fourth divergent, cylindrical, paraglossæ ensheathing the base of the tongue, produced into two elongate subfiliform processes, slightly widened and truncate at the apices, maxillary palpi six-jointed; wings with two submarginal cells; ♂ with the seventh ventral segment hidden, produced laterally into a long process, the eighth very narrow and long, widened and spoon-shaped at the apex, which is just visible beyond the sixth; posterior tibiæ with a basal patella. Although the labial palpi in this genus are certainly formed like those of the *Apidæ*, every other character it possesses associates it rather with this family, so that I have no doubt that it is right to place it here.

R. quinquespinosus, *Spin.*—♀ black, head and thorax clothed with short brown hairs, very finely and closely punctured, tegulæ piceous, wings subhyaline, darker at the apex, with only two submarginal cells, propodeum dull, radiately striate at the base, closely punctured posteriorly; abdomen dull, closely, finely, and evenly punctured, clothed with very short hairs, apex of each segment narrowly piceous, with a band of pale, ochreous, decumbent hairs, that of the basal segment interrupted, that of the fifth and sixth segments golden, fifth segment without a central rima, sixth with the pygidial area triangular, its margins narrowly raised, beneath punctured, apical margins of the segments pale, and clothed with pale hairs; legs clothed with golden hairs, intermediate calcaria very long, pale, and serrate inwardly, apical joints of the tarsi testaceous.

L. 9 mm.

The ♂ has not yet occurred in this country, but it may be readily known by its pale antennæ, and the spines of its sixth ventral segment.

Guestling, near Hastings, two ♀, Rev. E. N. Bloomfield,

to whom I am indebted for the specimen I have described; the ♀, much resembles an *Halictus*, but the two submarginal cells of the wings and simple fifth abdominal segment will distinguish it.

NOMADA, Fabr.

Labial palpi four-jointed, the joints cylindrical, maxillary palpi six-jointed, paraglossæ produced at the apex into an elongate sharp process, tongue elongate; cardines very long, lora slender, but well defined, submentum elongate, labrum transverse; clypeus in the ♂ densely hairy, second antennal joint exceedingly short, in the ♂ occasionally hardly visible; scutellum in both sexes generally more or less raised and often bituberculate, wings with three submarginal cells; abdomen generally more or less banded or spotted with yellow, six ventral segments exposed in the ♂, seventh simple, eighth generally produced at the apex into a narrow curved process, spinose or hairy at its sides and usually terminating in two recurved spines or hooks, genital armature with the cardo very large, and with the apices of the stipites generally densely tufted with hairs, their inner margin with a deep emargination, ♀ with the sixth ventral segment flat, truncate, armed at each side with several thick curved spines, stinging powers feeble, legs simple, ♀ without scopæ, apex of posterior tibiæ spinose, offering good specific characteristics. Packard says that the larvæ of this genus have, like *Andrena*, three conspicuous spines on the upper and posterior edge of the orbit.

This is perhaps one of our most interesting genera, it is essentially inquiline, some of its species are apparently constant to one particular host, some associate with several. It is also remarkable for the vivid wasp-like coloration of most of its species, which would seem rather to unfit them for the cuckoo sort of life that they lead. In most of the

inquiline genera the species closely resemble their hosts, but the species of *Nomada* are as unlike those of *Andrena*, *Eucera*, &c., with which they live, as could well be imagined, and yet they seem to pass in and out of the burrows of their hosts without molestation. It has been suggested that their wasp-like colours make them objects of terror to their hosts, but why this colour terrorism should be more useful here than in the cases of *Melecta*, *Colioxys*, *Psithyrus*, &c., is hard to see; the sting is feeble, as in *Andrena*, nor have I ever known one make itself felt, and if such a bee as *Eucera* were to turn and show fight to a *Nomada* the result would be almost certainly against the intruder. In such a case as this wasp-like colours might be protective, but *Eucera* is so much larger than its parasite, that one can hardly imagine but that some plucky individual in the course of ages would have tried its powers even against a presumed wasp, and I feel fully convinced that if a real wasp tried to enter a *Eucera* burrow, there would be a battle royal at once. It seems therefore evident that the inquiline life which these bees live is not disagreeable to those they live with, but how such a state of life has been attained is a problem the solution of which seems very doubtful. It has been suggested by several that the inquilines have once been industrious, but finding that they could live without working have gradually become differentiated from the species they originally belonged to, have lost their polliniferous organs and have assumed distinctive characters according to the various circumstances of each. This looks very reasonable in the case of *Psithyrus* which so closely resembles its host, *Bombus*, but in *Nomada* it is harder to conceive, for although nearly all its essential characters appear to be *Andreniform* its general aspect is so unlike that genus that if those views are correct, which is far from improbable, it must have left the parent stem in very ancient days. There is a great deal to be learnt yet about

the habits of this genus, it is not even certain to what genera it limits its visits. F. Smith records *N. varia* as the parasite of *Halictus cylindricus*, *N. solidaginis* of *H. leucozonius*. Mr. R. C. L. Perkins has shown the difficulty that would arise if this relationship were true, because, as he points out, the ♀ *Halictus* lives through the winter in an impregnated state and does not store pollen till the spring, so that these *Nomadæ*, which appear in August, would have no pollen on which to deposit their eggs. Either they too must live through the winter in an impregnated state, in which case they would appear again in the spring, which is not the case, or there is an unknown peculiarity about the habits of these *Halictus inquilines* yet to be discovered, or there has been some error in F. Smith's observations—this last alternative seems to me the most probable, as I have myself taken *N. varia*, which Smith associates with *Halictus cylindricus*, with the autumn brood of *Andrena fulvicrus*. All these questions add to the fascination of this beautiful genus; its species are closely allied, and often difficult to separate; the chief characters beyond colour, lie in the mandibles, the joints of the antennæ, the spines of the apex of the tibiæ, and the form of the apical segments of the abdomen in the ♂. The various hosts where known, will be given under each species. The genus is widely distributed over the northern hemisphere, but F. Smith states that very few species are known from the southern; the species are all more or less fragrant, like those of *Prosopis*, *Psithyrus*, &c.

- | | | |
|------|--|----------------|
| (2) | 1. Head ecarinate between the antennæ . | ORTUSIFRONS. |
| (1) | 2. Head distinctly and sharply carinated between the antennæ. | |
| (34) | 3. Labrum pale or with only slightly darker spots, species not very small. | |
| (5) | 4. Propodeum posteriorly bright and shining at the sides . | ROBERJEOTIANA. |
| (4) | 5. Propodeum posteriorly not bright and shining at the sides. | |
| (9) | 6. Scutellum not raised, entirely flavous, | |

- or with a single flavous spot in the centre.
- (8) 7. Abdomen with lateral spots, antennæ dark . . . SOLIDAGINIS.
- (7) 8. Abdomen with continuous bands, antennæ bright fulvous . . . FUCATA.
- (6) 9. Scutellum more or less raised, generally bituberculate, the tubercles reddish or flavous, or in many of the males and a few females entirely immaculate.
- (19) 10. Markings of second and following abdominal segments black and yellow, sharply defined, rarely in some varieties of *alternata* and *lineola* varied with brown.
- (12) 11. Head somewhat rostrate, viewed sideways much longer in front of the eyes than behind them . . . SEX-FASCIATA.
- (11) 12. Head not rostrate, viewed sideways scarcely or not longer in front of the eyes than behind them.
- (14) 13. Abdominal yellow bands, except the first, entire, posterior tibiæ of the ♀ armed at the exterior apex with two short, thick, curved spines . . . SUCCINCTA.
- (13) 14. One or more of the abdominal bands besides the first interrupted, posterior tibiæ of the ♀ unarmed at the apex, or with fine spines.
- (16) 15. ♂, antennæ short, almost entirely black, second and third joints of the flagellum subequal, scutellum with large conspicuous yellow spots; ♀, antennæ dark, posterior tibiæ unarmed . . . JACOBÆÆ.
- (15) 16. ♂, antennæ long, only dark at the base above, second joint of flagellum much shorter than third, spots of the scutellum, when present, small; ♀, antennæ pale, posterior tibiæ spinose at the apex.
- (18) 17. Tegulæ flavous; second joint of the flagellum in the ♂, looked at from beneath, not half so long as the third, second joint in the ♀ much shorter than the fourth . . . LINEOLA.
- (17) 18. Tegulæ almost always ferruginous; second joint of flagellum in the ♂ more than half the length of the third; second in the ♀ almost as long as the fourth . . . ALTERNATA.
- (10) 19. Abdomen brown, or brown and yellow, or if with black markings then with the black margined with brown.

- (21) 20. Joints of the antennæ in the ♂ tuberculated beneath; ♀, with the tubercles of the pronotum and two spots on the scutellum flavous, the pubescence of the thorax bright fulvous red . . . LATHBURIANA.
- (20) 21. ♂, antennæ simple; ♀ with the scutellar spots not flavous, pubescence of thorax not fulvous red.
- (31) 22. Mandibles acute at the apex.
- (24) 23. Abdomen clear brownish red, its markings cream-coloured or nearly white; posterior tibiæ in both sexes with five long equal spines, pale in the ♂, black in the ♀ . . . ALBOGUTTATA.
- (23) 24. Abdomen brown with yellow markings, posterior tibiæ often spined, but the spines unequal and irregular, or short and stout.
- (26) 25. Apex of posterior tibiæ in ♀ with three short thick spines . . . GUTTULATA.
- (25) 26. Apex of posterior tibiæ with long irregular pale spines.
- (30) 27. Scape of antennæ entirely black in the ♂, mesonotum entirely black in the ♀
- (29) 28. Prothoracic tubercles entirely flavous in the ♀, margined with flavous in the ♂ . . . LATERALIS.
- (28) 29. Prothoracic tubercles entirely ferruginous . . . BOREALIS.
- (27) 30. Scape of the antennæ in the ♂ flavous in front, mesonotum of the ♀ more or less striped with red . . . RUFICORNIS.
- (22) 31. Mandibles truncate, or bifid at the apex
- (33) 32. Mandibles bifid at the apex . . . BIFIDA.
- (32) 33. Mandibles simply truncate . . . OCHROSTOMA.
- (3) 34. Labrum black, or species very small (*furva*).
- (36) 35. Very large; ♂, anterior femora flattened and dilated, ♀, with an elevated tooth on the labrum . . . ARMATA.
- (35) 36. ♂, anterior femora simple, ♀, labrum simple.
- (42) 37. Labrum entirely black.
- (39) 38. ♂, with the fourth, fifth, and sixth joints of the antennæ somewhat swollen, the sixth to the tenth with a small tubercle beneath; ♀, antennæ short, third and fourth joints subequal . . . FERRUGINATA.
- (38) 39. ♂, antennæ simple; ♀, antennæ long, fourth joint much longer than third.
- (41) 40. ♂, face entirely black; ♀, antennæ with a wide black band below the apex . . . FABRICIANA.
- (40) 41. ♂, face at the sides above the mandibles,

- clypeus and mandibles flavous; ♀,
 antennæ entirely pale. FLAVOGUTTATA.
 (37) 42. Very small species, labrum pale or spotted
 with darker colour FURVA.

N. obtusifrons, *Nyl.*—(*mistura*, *Smith*; *xanthosticta*, *Smith*, 2nd ed., nec 1st.). Small, head and thorax closely punctured, clothed with ochreous hairs in the ♂, almost glabrous in the ♀, black, base of the mandibles, a spot on each side of the clypeus, and the extreme apex of each cheek, flavous in the ♂, testaceous in the ♀, labrum black, face between the antennæ with a broad blunt tubercle, not sharply carinated as in the other species, antennæ dark piceous, paler beneath, third joint longer than the fourth in the ♂, subequal to it in the ♀; prothoracic tubercles flavous in the ♂, testaceous in the ♀; mesonotum with the tegulæ piceous, wings slightly dusky, nervures dark piceous, scutellum unspotted, propodeum rather shining, its basal area glabrous; abdomen ferruginous, finely punctured, and clothed with short pale hairs, the base of the first three segments more or less widely black in the ♂, the second and third with a pale cream coloured spot on each side in both sexes, the fifth in the ♂ sometimes, and the fourth rarely, with a pale transverse line, fifth in the ♀ with a pale quadrate spot, the pale markings are frequently obsolete, apical fringe of the ♀ silvery, beneath ferruginous more or less spotted with flavous in the ♂, sixth ventral segment less densely hairy than in most of the species; apices of the stipites ending in a long blunt process, and clothed with fine, not very long hairs; legs ferruginous, femora, except at the apex, and a cloud across the tibiæ dark piceous, more uniform in colour and often paler in the ♀.

L. 6 mm.

Very rare. Norwich; (*Bridgman*); Ilfracombe; Yarm, Yorkshire; (*Smith*). Colchester; (*Harwood*). Bickleigh, Devon; (*Bignell*). Sidmouth; (*R. C. L. Perkins*). Land's End; (*Marquand*). Northumberland; (*Bold*). Rugby; (*Morice*). Perth; (*McGregor*). Ireland; (*Haliday*).

N. Roberjeotiana, *Panz.*—Head and thorax very slightly shining, deeply and closely punctured, clothed with short pale hairs in the ♂, almost glabrous in the ♀, mandibles, except at the extreme apex, labrum, clypeus, and sides of the face below the antennæ flavous in the ♂, ferruginous in the ♀, in which sex the clypeus is black except at the extreme apex, antennæ fulvous, narrowly black posteriorly, scape of the ♂ flavous in front, second joint visible in both sexes, third and fourth subequal; prothoracic collar and tubercles as well as the tegulæ flavous in the ♂, ferruginous in the ♀, wings dusky, clearer in the region of the submarginal cells, scutellum very slightly raised, ferruginous, metathorax in the ♀ with the post-scutellum ferruginous, propodeum shining, except on its basal area; abdomen bright ferruginous, the base of the first segment, a spot on each side of the base of the second, and the base of each of the following segments black, the second and third in both sexes, and the fourth in the ♂, with a cream coloured spot on each side, the fifth and sixth in the ♂ with a transverse line, the fifth in the ♀ with a quadrate spot of the same colour, seventh segment in the ♂ somewhat truncate, beneath ferruginous, black towards the apex, second and third segments sometimes with pale spots in the ♂, sixth densely clothed with somewhat curled pale hairs, eighth with the apical process very short and wide, broadly rounded at the apex, fringed with pale spines at the sides, with a long thick piceous spine on each side of the apex, genital armature closely resembling that of the preceding species, legs ferruginous, femora at the base black, and often a cloud on the posterior tibiæ dark.

L. 6-7 mm.

Rare. Occurs in July and August. Woking; Chobham; Blackwater, Hants; (*Smith*). Hilnest; Parley Heath; Elwington Wood; (*Dale*).

N. solidaginis, *Panz.* (*picta*, *Kirby*, *rufopicta*, *Kirby*).—Black, head and thorax largely and closely punctured

clothed with short pale hairs in the ♂, nearly glabrous in the ♀, ♂ with the mandibles, labrum, clypeus and face at the sides of the clypeus flavous, in the ♀ the base of the mandibles and sides of the face are flavous, the rest of the mandibles, labrum and apex of the clypeus ferruginous, its base black, antennæ piceous, paler beneath, scape of the ♂ flavous in front, of the ♀ ferruginous, third joint as long as, or longer than the fourth in both sexes; thorax with two spots on the collar, the tubercles, tegulæ, an oval spot on the mesopleuræ, and the scutellum flavous, wings dusky, propodeum closely punctured except on the basal area; abdomen black, rarely brown in the ♂, often so in the ♀, closely and finely punctured, a lateral spot on the second and third segments, and a more or less entire, wide band on each of the others flavous, seventh in the ♂, black, rounded at the apex; segments beneath black or brown, punctured at the base and more or less banded with yellow, eighth segment and genital armature much resembling that of *Roberjeotiana*, fifth segment in the ♀, fringed at the apex laterally with strong, black, curved hairs, sixth flat and impressed in the centre, truncate at the apex with three or four curved spines at each side; legs testaceous red, flavous at the knees; posterior coxæ spotted with yellow, posterior femora entirely black at the base in the ♂, black only on the inner side in the ♀.

L. 8-9 mm.

Common on *Senecio*, &c., occurs in July and August, and is generally distributed. F. Smith says it is parasitic on *Halictus leucozonius*, but for the reasons given under the head of the genus, I think this may be doubtful.

N. fucata, Panz. (*varia* Panz., Smith).—Black, head and thorax, dull, clothed with pale hairs, especially in the ♂, largely and rugosely punctured, mandibles, labrum, clypeus, and the sides of the face along the margins of the eyes flavous in the ♂, pale testaceous in the ♀, apices of the mandibles piceous, antennæ clear rufotestaceous, scape in the ♂ yellow

in front, and the seventh, eighth and sometimes the ninth joints with a black spot above, unicolorous throughout in the ♀; thorax with two spots on the collar, the pronotal tubercles, the tegulæ, a spot on the mesopleuræ in front, and a single spot on the scutellum flavous, wings with the nervures testaceous, propodeum dull, finely rugose; abdomen finely punctured basal segment with a broad brownish red band across its centre, each of the others with a yellow band, slightly constricted in the middle, apical dorsal valve in the ♂ deeply emarginate at the apex; beneath punctured, banded with yellow, sixth segment in the ♂ densely ciliated at the apex, seventh flattened and narrowed to the apex which is truncate, eighth with a narrow, ventrally raised, elongate process, which is armed along its sides with long spines which point backwards, and near its base has a few short fine spines pointing forwards, fifth segment in the ♀ with an apical fringe of thick recurved hairs, sixth flat, truncate, its sides near the apex with thick curved testaceous spines; legs testaceous, femora black at the base.

L. 10-12 mm.

Rare. Hollington, near Hastings, with *Andrena fulvicrus*, August, 1879. Eastbourne; Sandown, Isle of Wight; Kemp Town, Brighton; Darenth; (*Smith*), who says it is parasitic on *Halictus rubicundus* and *leucozonius*, which for reasons given above seems doubtful. Lulworth; Charmouth; Ambleside; Maidstone; (*Frisby*).

N. sexfasciata, *Panz.* (*Schæfferella*, *Kirby*, *connera*, *Kirby*).—Black, head and thorax closely and rugosely punctured, clothed rather densely with brownish grey hairs in the ♂, more sparingly with fulvous golden hairs in the ♀, clypeus produced and rather raised, and the cheeks rather unusually long, so that the head has a rostrate form, mandibles pointed, flavous, remote from the eyes, their apices piceous, labrum, clypeus, except a triangular basal spot in front, and sides of the face below the antennæ,

flavous in both sexes, face below the antennæ in the ♂ densely clothed with silvery hairs, antennæ fulvous, the scape in front flavous in the ♂, black along the back as far as the sixth joint in that sex, in the ♀ entirely fulvous slightly darker towards the apex; thorax with the tegulæ margined with yellow in the ♂, almost entirely yellow in the ♀, wings with piceous nervures, scutellum either spotless or with two small yellow spots in the ♂, with two large spots in the ♀; abdomen finely punctured, its first three segments each with a large yellow lateral spot, the next three with an entire yellow band, apical dorsal valve of the ♂ nearly entire; segments beneath more or less banded with yellow, fringed in the ♂ with golden hairs at the apex, sixth densely clothed with golden hairs at the apex, seventh narrowly rounded, eighth with a long apical process, strongly curved and fringed along the sides with fine long hairs with a few more spinose ones near the apex, fifth in the ♀ with a tuft of golden hairs on each side, sixth smooth and truncate, with several curved spines on each side, armature of the ♂ with the stipites bearing a dense apical tuft of hairs; legs in the ♂ yellow, posterior and intermediate femora black beneath, in the ♀ fulvous, femora black at the base.

L. 13–15 mm.

Parasitic on *Eucera*, and not rare where that bee occurs. It is found in May and June. Chobham; Woking; Hastings, one ♀ in August, 1879; Highgate; Southgate; Southend; (*Smith*). Norwich; (*Bridgman*). New Forest; (*Dale*). Gloucestershire; (*Perkins*). Sale; Bollin Valley, Lancashire; (*Hardy*).

N. succincta, *Panz.* (*Goodeniana*, *Kirby*).—Black, head and thorax closely and rugosely punctured, clothed with greyish brown hairs, which are more abundant in the ♂ especially on the face and beneath, sides of the face below the antennæ yellow in both sexes, mandibles, except their piceous apices and labrum, yellow in the ♂, ferruginous in the ♀, clypeus except at the base yellow in the

♂, black in the ♀, with only its extreme apical margin piceous, antennæ fulvous, black posteriorly in the ♂ as far as the eighth joint, and with the scape yellow in front, in the ♀ entirely fulvous, third and fourth joints subequal in both sexes; thorax with two spots on the collar, the tubercles, tegulæ, two spots on the scutellum, which are larger in the ♀ and sometimes absent in the ♂, yellow, the ♂ has also the anterior margin of the mesopleuræ yellow, and the ♀ often has two spots on the propodeum and occasionally a spot on the postscutellum yellow, wings slightly smoky, nervures testaceous; abdomen finely punctured, basal segment with an interrupted, very rarely entire, each of the others with an entire, transverse band, yellow, apical dorsal valve in the ♂ deeply emarginate, segments beneath banded with yellow, sixth in the ♂ with its apical margin yellow, eighth with a long narrow apical process, recurved dorsally and armed on each side with long spines, those near the apex longest, armature with the stipites converging at their apices, clothed with very long hairs; sixth segment in the ♀ formed much as in the other species; legs fulvous yellow in the ♂, fulvous in the ♀, the femora beneath more or less black, anterior and intermediate coxæ and trochanters and all the legs anteriorly, more or less flavous; posterior trochanters densely hairy beneath, apex of the posterior tibiæ in the ♀ armed outwardly with two short teeth, the outer one curved inwards.

L. 11-13 mm.

Generally distributed and common; appears in April.

N. lineola, *Panz. (capræ, Kirb., subcornuta, Kirb., cornigera, Kirb., 6-cincta, Kirb.)*. Very like the preceding in colour, but with the second and usually also the third abdominal pale bands interrupted; this character alone will serve to distinguish them apart, but the following structural characters are more reliable: the antennæ are long as in that species with the joints of the flagellum

longer than wide, but the third joint of the antennæ is much shorter in proportion to the fourth, this in the ♂, looked at from beneath, is not half, and in the ♀ scarcely more than half the length of the fourth; the ♀ is without the pale sides of the face so characteristic of *succincta* and *serfasciata*; the eighth ventral segment of the ♂ has its apical process more slender, the sides near the apex with finer paler spines, and the posterior coxæ are less densely hairy; the tibiæ in both sexes are armed with spines round the apex exteriorly, these are fine and long in the ♂, short and dark in the ♀.

L. 10-13 mm.

Generally distributed and not uncommon in April and May, parasitic probably on several spring species of *Andrena*.

This species varies much in colour, and in the extent of the yellow; sometimes the basal segment is banded with red.

N. alternata, Kirby (*Marshallia*, Kirby).—Exceedingly like *lineola* but differing in the following particulars; the third joint of the antennæ is longer, and the fourth shorter, so that the third joint in the ♂ is more than half as long, and in the ♀ almost as long, as the fourth. The tegulæ are ferruginous, though occasionally flavous in the ♂, in which sex the tibiæ have a black streak posteriorly; in the ♀ the apical spines of the tibiæ are pale, not black.

L. 10-13 mm.

Perhaps the commonest spring species, and generally distributed. Parasitic on *Andrena nigroaenea* and *atriceps* and probably on others also. F. Smith once observed it in the burrows of *Eucera*. Mr. Frisby has a very curious ♀ example of this species which has the coloration of the ♂, and the abdomen distorted; possibly this may be the effect of stylopization, but I know of no other record of a species of this genus being affected by this parasite.

N. jacobææ, *Panz. (flavopicta, Kirb.)*.—Very like the two preceding in coloration, but shorter and more compact. Head and thorax nearly glabrous in both sexes, but the face below the antennæ in the ♂ clothed with silvery hairs; antennæ with the flagellum almost entirely black or piceous in both sexes, its joints short, as wide, or almost as wide, as long, third and fourth joints of the antennæ subequal in the ♂, third distinctly longer than the fourth in the ♀, cheeks at the side of the clypeus flavous in the ♂; thorax with the tubercles, tegulæ and scutellar prominences very pronounced and flavous, wings smoky, a round spot on the mesopleuræ yellow, propodeum, with a yellow spot on each side in the ♀; abdomen with the second and third abdominal bands widely interrupted in both sexes, apical dorsal valve black in the ♂, piceous in the ♀, segments beneath banded with yellow, sixth in the ♂ densely hairy in the centre of its apical margin, central process of the eighth very long, not dilated at the apex, which bears two strong somewhat recurved spines, the sides of the process fringed with hairs, genital armature with long terminal hairs on the stipites; ♀, fifth segment densely clothed with hairs at the apex laterally; legs clear orange testaceous, coxæ, trochanters and base of posterior femora black, apices of tibiæ without spines or teeth outwardly.

L. 10–12 mm.

Local but not rare; it occurs in July and August on *Senecio*. Smith says he found it entering the burrows of *A. fulvicrus* at Littlehampton. Sidmouth; Hastings; Bournemouth; Swanage; (*Dale*). Tavistock; (*Swale*). Yorkshire; Norwich; (*Bridgman*). Lancashire and Cheshire; (*Gardner*). Colchester; (*Harwood*).

N. Lathburiana, *Kirby (rufiventris, Kirb.)*.—Head and thorax black, closely and rugosely punctured, clothed with ochreous hairs in the ♂, with bright fulvous in the ♀, mandibles except their piceous apices, labrum, clypeus, a spot above it, and sides of the face yellow in the ♂,

fulvous red in the ♀; antennæ fulvous, ♂ with the first six or seven joints black above, and with the scape yellow in front, the fifth to the thirteenth joints beneath bearing a small pointed tubercle, entirely fulvous and simple in the ♀; thorax with the tubercles yellow in both sexes, the tegulæ flavous in the ♂, testaceous in the ♀, wings slightly smoky, nervures testaceous, scutellum with two yellow spots, propodeum finely rugose; abdomen brownish-black, basal segment with a paler brown band, the rest each with a wide yellow basal band, eighth segment in the ♂ with the central process only slightly widened at the apex, its sides with rather long, somewhat reflexed hairs; legs fulvous, femora black beneath in the ♂, black, except at the extreme apex, in the ♀, in which sex the posterior tibiæ are armed at the apex with a short blunt tooth and two or three short thick pale spines.

L. 11-13 mm.

Apparently a local species, but widely distributed. Smith says it is not rare about Hampstead and Highgate and also records it from Scotland. I have never taken it myself. Other localities recorded are Glanvilles Wootton; Lulworth; Isle of Wight; (*Dale*). Exeter; (*Parfitt*). Edgbaston; (*Marshall*). Smith says it is parasitic on *Andrena labialis* and "*A rufa*" (? *fulva*). Schmiedeknecht gives it as parasitic on *Andrena pratensis*.

N. alboguttata, *II. Schf.* (*baccata*, *Smith*, *læta*, *Thoms.*).—Head and thorax black, largely and rugosely punctured, the latter with four broad rufotestaceous longitudinal stripes on the mesonotum in the ♀; labrum, mandibles, except their piceous apices, clypeus and sides of the face, flavous in the ♂, rufotestaceous in the ♀, antennæ rufotestaceous, scape flavous in front in the ♂, and their first four or five joints black posteriorly, third joint in that sex much shorter than the fourth; in the ♀ the antennæ are entirely rufotestaceous, and the third and fourth joints are subequal, thorax with the tubercles

in the ♂ more or less flavous; these as well as the prothoracic collar rufotestaceous in the ♀, tegulæ testaceous in both sexes, mesonotum entirely black in the ♂ except two small yellow spots more or less bordered with fulvous on the scutellum, rufotestaceous stripes in the ♀ very wide, leaving only narrow black lines between them, scutellum entirely rufotestaceous, mesopleuræ each with a small yellow spot and clothed with long white hairs in the ♂, with a large rufotestaceous spot in the ♀, propodeum in the ♀ with two small rufotestaceous spots at the base inside the basal area, and two larger ones below, sides clothed with shining silvery hairs; abdomen bright, rather pale rufotestaceous, second to fifth segments in the ♂, second to fourth in the ♀, each with a pale cream coloured spot on each side, those of the second segment largest, fifth in the ♀ and sixth in the ♂ with a square spot in the centre, apical dorsal valve of ♂ narrowly emarginate; beneath rufotestaceous fifth segment in the ♂ densely hairy, eighth segment with the apical process winged on each side almost to the apex and fringed with fine pale spines, stipites with a large triangular apical process, fringed with long hairs on its outer margin; legs rufotestaceous, extreme base of the femora more or less black, posterior tibiæ armed round the apex externally with five long subequal spines, pale in the ♂, black in the ♀.

L. 7-9 mm.

Rare, occurs in August and is parasitic on *Andrena argentata*. Woking; Chobham; Bournemouth; Sandhurst; Farnborough; (*Smith*).

Variable in the extent of the paler colour, a larger form, the 5-*spinosa* Thoms., occurs on the Continent, but so far as I know it has not been met with in Britain.

N. guttulata, *Schenck (rufilabris, Thoms.)*.—Of this very distinct species I possess a single ♀ without locality, and I only retain it in the list because, as it occurs in Sweden, I think it is quite probable it will turn up again in this country.

It may be known at once from *ochrostoma*, which it most resembles, by its smaller size, sharp mandibles, and the three short black blunt spines round the exterior apex of the posterior tibiæ. This last character distinguishes it from all the other species of the genus; the third and fourth joints of the antennæ are subequal.

L. 9 mm.

Thomson describes this species from Sweden under the name of *rufilabris*.

N. ruficornis, Linn. (*flava*, Kirb., *signata*, Jur.).—Head and thorax black in the ♂, sometimes nearly red in the ♀, closely punctured, densely clothed with brownish-grey hairs in the ♂, less densely with shorter brownish hairs in the ♀; mandibles, labrum, clypeus, and sides of the face flavous in the ♂, ferruginous in the ♀; mandibles acute, piceous at the apex; antennæ fulvous, unicolorous in the ♀, more or less black posteriorly, with the scape yellow in front in the ♂, third joint about half the length of the fourth in the ♂, about three-quarters its length in the ♀, face in the ♂ clothed with silvery hairs below the antennæ; thorax black in the ♂, with the tubercles and tegulæ testaceous in both sexes, sometimes paler in the ♂, ♀ with the pronotal collar ferruginous, mesonotum normally with four longitudinal fulvous stripes, these may become so wide as hardly to leave any black between them, or become narrow or fragmentary so that the whole mesonotum is nearly black, mesopleuræ in the ♀ with a large red spot, scutellum in the ♂ black or spotted with fulvous, in the ♀ fulvous, wings slightly clouded, especially apically, propodeum finely rugose, sometimes spotted with fulvous in the ♀, or in var. *signata* with yellow; abdomen finely punctured, shining, brown, black at the extreme base, its markings varying from a single yellow spot on each side of the second segment and a square spot on the apical one, to an entire yellow band on each of the segments, the apices of the segments sometimes margined with black, basal segment often entirely

brown, or with two round brown spots on the disc, segments beneath, brown more or less banded with yellow, eighth in the ♂ with the apical process long, much curved, not widened at the apex, finely fringed laterally with hairs, and with two strong, reflexed apical spines, fifth segment in the ♀ with a lateral tuft of black hairs; legs fulvous, sometimes more or less clouded with black, the base of the femora more or less black, posterior tibiae armed round the apex with pale spines of uneven length.

L. 7-13 mm.

This species is common and generally distributed, and is of extraordinary variability both in colour and size, so that little dependence can be placed on these characters. It appears in April, and has been taken in July; it is parasitic on several species of *Andrena*. I have taken var. *signata* with *A. fulva*.

N. bifida, *Thoms.*—Closely allied to *ruficornis*, and almost identical in colour with some of its varieties. In the ♂ the pale abdominal bands are usually entire or nearly so; the ♀ has generally two large lateral spots on the second segment, a small one on each side of the third, and a transverse basal line on the fourth and fifth. The characters by which it may be known from *ruficornis* are the bifid mandibles; these are bilobate in the ♂; bidentate in the ♀; the pubescence of the thorax, which is denser in the ♂; the conspicuous patch of silvery hairs on each side towards the apex of the propodeum in the ♀, and the dense silvery pubescence at the apex of the posterior tibiae, the spines of which in the ♀ are of equal length.

L. 8-11 mm.

Apparently widely distributed, though probably mixed in many collections with *ruficornis*. Canterbury; Chobham. Maidstone; (*Frisby*). Hampstead; (*Enock*). Gloucestershire; (*Perkins*). Bickleigh; Cornworthy; Totnes; (*Bignell*). Colchester; (*Harwood*). Norwich; (*Bridgman*). Rugby; (*Morice*). Perth; (*McGregor*). Pollshone, Ireland; (*Cuthbert*).

N. borealis, Zett. (*inquilina*, Smith).—Like a very dark *ruficornis*, and without any very strong structural characters to distinguish it therefrom; by its colour, however, and the denser, thicker hairs of the legs, it is easily recognizable. Mandibles acute, antennæ dark piceous, paler beneath, scape entirely black in both sexes, clypeus with only the margin pale in the ♂; thorax with the tubercles and tegulæ piceous, mesonotum in both sexes without red lines, scutellum obscurely red in the ♀, the brown colour of the abdomen darker and more suffused with black, especially in the ♀; legs dark piceous, posterior femora more largely punctured, and clothed on their outer side in the ♀ with bristly black hairs, densely clothed in the ♂ with whitish hairs.

L. 9–11 mm.

Parasitic on *Andrena Clarkella*, and taken by Mr. Frisby with *A. lapponica*; usually rare but very widely distributed, and probably to be found wherever *A. Clarkella* occurs. It is recorded from Ireland and as far north as Newcastle. It also doubtless occurs in Scotland, as *A. Clarkella* is not uncommon there.

N. lateralis, Panz. nec Smith (*xanthosticta*, Sm., 1st ed., *Bridgmanniana*, Smith).—Very different to the preceding in general colour, but really very closely allied to it, although the females are abundantly distinct. As a rule, however, both sexes are smaller, the ♂ differs further in having the sides of the face flavous, and the hairs below the antennæ bright silvery, whereas in *borealis* they are tinged with brown, the tubercles are margined with flavous, and the abdomen is pale brown black at the extreme base, each segment with a transverse yellow band or wide lateral spots; femora rather less hairy than in *borealis*. The ♀ is abundantly distinct from any other species; like *borealis*, it has the scape of the antennæ and mesonotum entirely black, except the scutellar spots, but the flagellum of the antennæ

is paler, the labrum has two dark spots, the tubercles of the prothorax are flavous, the mesonotum much less hairy, the abdomen entirely pale brown except the base and extreme apex of the basal segment, which are black, and a small round spot on each side of the second segment, which is yellow, occasionally there is a very minute yellow spot on each side of the third segment, and a central spot on the fifth of the same colour; posterior tibiæ with five rather short piceous spines round the exterior margin of the apex, posterior metatarsi black, posterior femora not clothed with bristly hairs.

L. 8-9 mm.

Rare. Parasitic on *Andrena lucephala*. Hampstead; (Smith). Brundall, Norwich; (Bridgman). Sudbury, Suffolk; (Harwood). Northumberland; (Bold). Lancashire and Cheshire; (Gardner). Boxhill; (Perkins). Stoke Newington; (Marshall).

N. ochrostoma, Kirby (*Hillana*, Kirby, *vidua*, Smith, *punctiscuta*, Thoms.).—Another of the *ruficornis* group, but easily distinguished from all the others by the simply truncate mandibles. The head and thorax in the ♂ are black with the mouth parts and cheeks yellow, the scape of the antennæ testaceous; in the ♀ the mouth parts are ferruginous, and the mesonotum is striped with ferruginous, the sides of the vertex and the cheeks behind the eye and a large spot on the mesopleuræ are also of the same colour, the tegulæ and tubercles in both sexes are testaceous, in the ♀ the puncturation of the mesonotum, and especially of the scutellum, is much coarser than in *ruficornis*; the latter is red or spotted with red in both sexes; abdomen pale brown ♂, reddish brown ♀, its base black in both sexes, all the segments except the basal with lateral yellow spots, the apical margin more or less black, the black colour widening laterally, and occupying the base of the following segment, in the ♀ the spots on the second segment are round, and very near the lateral margin, those of the third

like them but very small, sometimes absent, those of the fourth transverse and discal, the fifth with a central square spot, the segment margined with black as in the ♂, segments beneath margined with black, and sometimes more or less spotted with yellow, eighth segment in the ♂ with the apical process short, curved, and dilated at the apex, sides spinose near the apex, fringed with hairs towards the base, armature very like that of the allied species, legs ferruginous, femora black at the base beneath, and there is often a spot on the tibiae inwardly, apex of the posterior tibiae armed with irregular spines in the ♂, with five pale spines of nearly equal length in the ♀.

L. 8-9 mm.

Not rare; appears in June. F. Smith says it is parasitic on *Andrena labialis*; Mr. R. C. L. Perkins and I have taken it with *A. Wilkella*. Chobham; Woking; Bromley; Ilfracombe; Isle of Wight; Worthing. London District; Yorkshire; (*Smith*). Hastings; (*Bennett*). Oxford; Chippenham; (*R. C. L. Perkins*). Glanvilles Wootton; Weymouth; (*Dale*). Bickleigh; (*Bignell*). Land's End; (*Marquand*). Norwich; (*Bridgman*). Gloucestershire; (*V. R. Perkins*). Colchester; (*Harwood*).

N. armata, *H.-Schff.*—The largest British species of the genus. Head and thorax black, densely and rugosely punctured, clothed with grey hairs in the ♂, with short brown hairs in the ♀, the hairs on the face below the antennae silvery in both sexes, labrum black, with a well-developed apical tooth, mandibles ferruginous, yellow at the base in the ♂, anterior margin of the clypeus and the margins of the eyes narrowly ferruginous in the ♀; antennae ferruginous, scape in the ♂ black, pale at its sides in the ♀, which also has the eighth to the eleventh joints dark; collar of pronotum, scutellum, and postscutellum in the ♀, and tegulae and tubercles of both sexes ferruginous, wings clouded, with a distinct apical band, mesopleurae with a transverse patch of silvery hairs in the ♀, and propodeum

in that sex with a wide line of silvery pubescence down each side; abdomen bright ferruginous, its extreme base black, second, third, and fourth segments with a yellow spot on each side, fifth and sixth with an apical dorsal spot, base of the fifth and sixth segments sometimes black in the ♂, seventh segment narrow, deeply emarginate at the apex, beneath ferruginous, apices of the segments with silvery hairs at the sides; the species is so rare that I have been unable to dissect out the terminal segments of the ♂; legs ferruginous, femora nearly entirely black, the anterior pair angularly dilated in the ♂, black at the base and beneath, and simple in the ♀, tibiæ and tarsi ferruginous in the ♂, posterior metatarsi black above, posterior tibiæ in the ♀ with a black mark inwardly, and posterior coxæ densely clothed with silvery hairs.

L. 11–12 mm.

This very fine species is rare, and parasitic on *Andrena Ilattorfiana*, appearing in July. Deal; Salcombe; Sidmouth; Woollacombe, Morthoe, North Devon; (Smith). Ventnor; (Rothney). Norwich; (Bridgman). Exeter; (Parfitt). Penzance; (Marquand).

N. ferruginata, Kirby (*germanica*, Smith, var. *atrata*, Smith).—Head and thorax black, closely and rugosely punctured, rather densely clothed with greyish-brown hairs, mesopleuræ in both sexes, and face below the antennæ in the ♂, clothed with silvery hairs, mandibles and cheeks between them and the eyes, flavous in the ♂, ferruginous in the ♀, their apices rather rounded and piceous, labrum black with a central tooth, clypeus black, its extreme apex and sides testaceous in the ♀, antennæ black above in the ♂, with the scape black in both sexes, very wide in the ♂, the second joint hidden in that sex, and the third, fourth, and fifth swollen, sixth to ninth with a small lateral tubercle, apical joint nearly as long as the two preceding together, ♀ with the flagellum simple; thorax with the tubercles, tegulæ and two spots on the scutellum in both sexes, and pronotal

collar in the ♀ ferruginous, wings with a dark apical border ; abdomen finely punctured, ferruginous, extreme base black, and with a black lateral spot at the base of the second and third segments, and a black line along the base of the others, the colour sometimes spreading on to the preceding segment ; these black markings are sometimes wanting on one or more of the segments ; beneath punctured, base of each segment black in the middle, apical margins fringed laterally with white hairs, eighth segment in the ♂ with the central process short, much dilated apically and armed at each side with two strong reflexed spines, the sides of the process fringed with hairs, legs ferruginous, femora at the base, especially beneath, black, posterior pair densely hairy beneath, tibiæ with a black spot near the apex, posterior metatarsi black.

L. 7-8 mm.

Parasitic on *A. fulvescens* and appears in July and August, not common, but has occurred at Chobham ; Woking ; Ilfracombe ; Bournemouth ; Hawley, Hants ; Deal ; Arundel ; Redhill, Surrey ; Salcombe ; (*Smith*). Exeter ; (*Parfitt*). Land's End ; (*Marquand*). Oxford ; (*R. C. L. Perkins*). Stretford and Bowdon ; Lancashire ; (*J. R. Hardy*). Maidstone ; (*Frisby*). Yorkshire.

N. Fabriciana, Linn. (*Fabriciella*, Kirby, 4-notata, Kirby).—Head and thorax entirely deep black, clothed with greyish hairs, except the cheeks between the eyes and mandibles, which are flavous in the ♂, and the face below the antennæ which is clothed with silvery hairs in that sex, antennæ with only the flagellum piceous beneath in the ♂, in the ♀ the scape is black, the third joint is ferruginous beneath, black above, third to the sixth are entirely ferruginous, the seventh to the eleventh are black, the apical joint ferruginous ; thorax with the tegulæ testaceous in the ♀, wings clouded, with a distinct apical band, propodeum with the basal area finely rugose ; abdomen ferruginous, its extreme base black, second and third segments often

with a yellow spot on each side, margins of the segments generally more or less black, dorsal valve in the ♂ sharply emarginate, beneath ferruginous, sides of the fifth segment in the ♀ with a dense tuft of black hairs, eighth in the ♂ with a very long laterally fringed apical process scarcely dilated at the apex, which has a fine somewhat reflexed spine at each side; legs black, knees, anterior femora, and anterior, intermediate, and sometimes posterior tibiæ pale in front.

L. 7-9 mm.

Not rare and widely distributed; end of March to August, probably parasitic on *Andrena Gwynana*. Smith says on *Panurgus Banksianus*; very probably it associates with several species, and is double brooded. It has not yet been recorded from Scotland or Ireland.

N. flavoguttata, Kirby.—Smaller than any of the preceding and more slender, head and thorax black, clothed with pale hairs, which are longer, more abundant and greyish in the ♂, mandibles, clypeus, except at its base, and cheeks at its sides flavous in the ♂, ferruginous in the ♀, labrum black in both sexes, antennæ rather unusually long with the scape black, the flagellum ferruginous, more or less dark posteriorly, fourth joint twice or more in the ♂, nearly twice in the ♀ as long as the third; thorax with the tubercles and tegulæ testaceous in both sexes, pronotal collar, scutellum, or two spots on it, postscutellum, generally two lines on the mesonotum, and a spot on each of the mesopleuræ in the ♀ ferruginous, wings smoky with a dark apical margin, propodeum shining at the base, with a tuft of silvery hairs in the ♀ on each side above the insertion of the abdomen; abdomen ferruginous, black at the extreme base, second and third segments with a flavous spot on each side, very small in the ♀, these spots are not well defined, and often are scarcely noticeable or absent, third and fourth segments at the apex, and fifth at the base dark, apex of the fifth in the ♀, clothed with

silvery hairs, beneath ferruginous, eighth segment in the ♂ with the apical process long, rather dilated at the apex, with long reflexed apical spines; fifth segment in the ♀ with a tuft of dark hairs on each side, legs piceous in the ♂, femora in front, knees and tibiæ paler, ferruginous in the ♀, femora at the base, and the posterior pair beneath black, posterior tibiæ with two uneven spines near the outer angle.

L. 6-7 mm.

A very distinct species easily known from the others, which have the labrum black, by its slender form, long, pale antennæ and the great length of their fourth joints.

Not rare and generally distributed. I have taken it freely, flying about a bank in company with *A. Wilkella* and *A. nana*, although I did not actually see it enter the burrows of either.

N. furva, *Panz.* (*Sheppardana*, *Kirb.*, *rufocincta*, *Kirb.*, *Dali*, *Curt.*).—This diminutive *Nomada*, which is quite distinct from any of our other species, is dark pitchy brown in colour; head and thorax closely punctured, sparingly clothed with pale ochreous hairs, mandibles in the centre, extreme sides of the clypeus, and the cheeks between the eyes and mandibles flavous in the ♂, these and also the anterior edge of the clypeus, testaceous in the ♀, labrum dark in the ♂ with two pale spots, testaceous in the ♀, antennæ with the scape black, the other joints piceous, paler beneath, the apical joint testaceous, third and fourth subequal in the ♂, third shorter than the fourth in the ♀; thorax with the tegulæ and tubercles piceous, wings clouded, with a dark apical margin, ♀ with a rufescent spot on the mesopleura; abdomen piceous in the ♂, with a yellow lateral spot on the second, and sometimes also on the third segment, occasionally with a basal line of the same colour on the other segments, in the ♀ without yellow spots, but with pale, lateral spots or transverse bands, fifth

segment with a dense apical fringe of white hairs, beneath piceous with paler bands, eighth segment in the ♂ with a very short, nearly straight, apical process, armed with two very strong recurved hook-like spines at the apex, stipites of the armature produced at the apex into an elongate curved process terminating in a narrow point, which is tufted with hairs and slightly bent outwards, another tuft of hairs is situated on the outer edge of the curve of the process.

L. 4-5 mm.

This is a common and generally distributed species. F. Smith thinks it is parasitic on *Halictus morio* and *minutus*, which is improbable for the reasons I have given, but he also says that Mr. G. Newport found numbers of it in the cells of a species of *Colletes*.

APIDÆ.

This family includes the larger number of our *Anthophilous* genera, although the genera themselves are less extensive. The tongue is elongate in all, the lora well developed, the labial palpi sheath-like in the form of their basal joints; the labrum transverse in some genera, elongate or quadrate in others, polliniferous hairs either on the tibiæ, femora, and metatarsi, or on the ventral surface of the abdomen; absent in the inquiline genera; abdomen usually more cylindrical and wider at the base than in the *Andrenidæ*; in some genera the anal orifice of the ♂ is inferior, the sixth segment having its dorsal surface bent downwards so as to form the apex of the abdomen, this arrangement limits the space allowed for the ventral segments which accordingly are usually in such cases more or less "telescoped" under each other, but the forms of these hidden segments are often most peculiar and valuable as specific characters.

- (18) 1. Second joint of labial palpi considerably more than half the length of the first, generally exceeding the first in length.
- (5) 2. Wings with three submarginal cells.
- (4) 3. Maxillary palpi six jointed, abdomen blue or metallic . . . CERATINA.
- (3) 4. Maxillary palpi one jointed, abdomen black with white pubescent spots . . . EPEOLUS.
- (2) 5. Wings with two submarginal cells.
- (7) 6. One joint only at the apex of the labial palpi cylindrical and divergent . . . CHELOSTOMA.
- (6) 7. Two joints at the apex of the labial palpi cylindrical and divergent.
- (9) 8. Species very small, dull, first segment of the abdomen strongly and transversely carinated at the base . . . HERIADES.
- (8) 9. Abdomen not carinated at the base, or species not very small and dull.
- (17) 10. Maxillary palpi two or three jointed.
- (12) 11. Eyes hairy . . . CÆLIOXYS.
- (11) 12. Eyes not hairy.
- (16) 13. Apex of the abdomen in the ♂ spinose, denticulate or emarginate, ♀ with a ventral scopa.
- (15) 14. Abdomen without yellow markings . . . MEGACHILE.
- (14) 15. Abdomen with yellow markings . . . ANTHIDIUM.
- (13) 16. Apex of the abdomen in the ♂ simple, ♀ without a ventral scopa . . . STELIS.
- (10) 17. Maxillary palpi four jointed . . . OSMIA.
- (1) 18. Second joint of labial palpi not, or only just half so long as first.
- (20) 19. Anterior wings with two submarginal cells . . . EUCERA.
- (19) 20. Anterior wings with three submarginal cells.
- (24) 21. Maxillary palpi five or six jointed.
- (23) 22. " " five jointed . . . MELECTA.
- (22) 23. " " six jointed . . . ANTHOPHORA.
- (21) 24. " " one, two, or four jointed.
- (26) 25. Maxillary palpi four jointed . . . SAROPODA.
- (25) 26. " " one or two jointed.
- (30) 27. " " two jointed.
- (29) 28. ♂, posterior tibiæ fringed on their outer margin with short hairs, posterior tibiæ of ♀ convex and hairy. . . PSITHYRUS.
- (28) 29. ♂, posterior tibiæ fringed on their outer margin with long hairs, posterior tibiæ of ♀ concave and shining . . . BOMBUS.
- (27) 30. Maxillary palpi one jointed. . . APIS.

EPEOLUS, Latr.

This genus consists of comparatively few species, most of which, according to Smith, are American; they are short and robust in form, the labial palpi are four-jointed, the second joint being about three-quarters the length of the first, two small joints at the apex are deflected and cylindrical, the apical one shortest, paraglossæ elongate at the base, produced laterally into an elongate curved spine-like process, maxillæ blunt at the apex, their palpi only one-jointed, lora well defined but short, submentum elongate, labrum subtransverse, bituberculate, antennæ short, their joints transverse; scutellum raised, dentate laterally, much produced posteriorly over the metanotum, mesopleuræ dilated and rounded, propodeum nearly vertical; abdomen short, subtriangular, variegated with spots of pale pubescence; ♂ with six ventral segments exposed, the seventh truncate, the eighth narrow and tongue like, ♀ with the sixth ventral segment produced into a long, somewhat spathulate process on each side. This is a character I have not observed in any other genus. The species are parasitic on members of the genus *Colletes*.

E., productus, Thoms. (*variegatus*, pars, Smith).—Black, head and thorax largely and rugosely punctured, labrum tridentate at the apex, and with two small tubercular teeth near the middle, mandibles pitchy red in the centre, pronotal collar, and two short stripes on the mesonotum in front, clothed with ochreous pubescence in the ♂, with fulvous (soon fading to ochreous) in the ♀, mesopleuræ and sides of propodeum with ochreous pubescence in both sexes, tubercles black, rufescent in the ♀, tegulæ rufescent, wings slightly dusky, apex darker, nervures testaceous at the base, scutellum red in the ♀, much produced in both sexes over the metathorax, with a slight dorsal impression, its lateral angles dentate, propodeum shining; abdomen closely punctured, the apical

margins of the segments testaceous in the ♂, first segment with a lateral transverse spot of pale pubescence at the base and apex sometimes united at the side, the following segments each with four apical transverse oval spots, rarely more or less confluent, apical dorsal valve narrow in the ♂, rounded at the apex, its sides subparallel, beneath dull and closely punctured in the ♂, second and third segments paler at the apex and clothed with silvery hairs, fourth and fifth emarginate, densely fringed with curved brown hairs, somewhat shining in the ♀, second segment largely and distinctly punctured, third and fourth with a pubescent apical band, apical segment narrowly rounded, sixth truncate, lateral processes, narrow, long, and spathulate, denticulate at the sides; legs ferruginous in the ♂, with the femora black, fulvous red in the ♀, posterior and intermediate femora black above.

L. 8–10 mm.

Littlehampton; Hayling Island; Woking; Hastings. Land's End; Lulworth; Sandown; (*Dale*). Bollin Valley and Sale; (*J. R. Hardy*). Charing, Kent; Weybridge; (*Marshall*). Colchester; (*Harwood*). Lowestoft; (*Morice*). Saunton, North Devon; (*Swale*).

E. rufipes, *Thoms.* (*variegatus*, *pars*, *Smith.*)—Exceedingly like the preceding, but distinguishable by the following characters:—

Labrum with its apical margin simple not tridentate, the discal tubercles situated considerably below the middle. The puncturation of the thorax is rather less coarse, and the scutellum less raised. The spots on the abdomen are more transverse, and have a greater tendency to become confluent, the apical dorsal valve in the ♂ is more narrowed to the apex, beneath the abdomen is dull, more rufescent, and the second segment in the ♀ is closely and finely punctured, the apical segment is very largely and widely rounded, the processes of the sixth segment are wider in the stalk, so that they are less spathulate, and their apices are scarcely denticulate. The legs in the ♀ are entirely red.

L. 5.8 mm.

Deal; Falmouth; Chobham; Woking. Shiere; (*Dr. Capron*). Colchester; (*Harwood*). Isle of Wight; (*Champion*). Parley Heath; (*Dale*). Budleigh Salterton; (*Smith*). Norwich; (*Bridgman*).

CERATINA, Latr.

A genus of small, nearly glabrous, shining metallic bees of which there is only one British species. The labial palpi are four-jointed, having two small deflected cylindrical joints at the apex, maxillary palpi six-jointed, labrum transverse, lora well developed; antennæ short; thorax nearly round, wings with three submarginal cells, the marginal cell rounded at the apex, abdomen subclavate, ♂ with the anal orifice inferior, the seventh dorsal segment having a ventral aspect, five ventral segments exposed in the ♂, the extreme apex only of the sixth being visible, genital armature subquadrate, with the sides of the stipites straight and subparallel, their laciniae bent inwards at a distinct angle, sagittæ very far apart, converging towards the apex like the stipites, spatha large and membranous, covering the basal half of the sagittæ. After careful dissecting I have been unable to detect any distinct seventh ventral segment in the ♂, the eighth appears to be membranous at the apex, and is recognizable by the central basal prolongation, I can only imagine that the sixth and seventh have become united into one. These little bees, of which there are several continental species, nidificate in bramble stems or in the hollow stems of other plants, they are allied to the large *Xyllocopa* so well known on the Continent, the ♀ has no distinct pollen brush.

C. cyanea, Kirby.—Blue, shining, almost glabrous, largely punctured, clypeus and labrum in the ♂ white, antennæ black or piceous, mesonotum shining less brightly blue, and less closely punctured than the head;

wings with a brownish tinge, propodeum finely rugose at the base; abdomen closely and largely punctured, sixth segment at the apex carinated down the middle, the carina less marked in the ♀, ♂ with the seventh segment inflected, hidden from above, its apex bidentate; ventral segments one to five visible in the ♂, the apex only of the sixth apparent, this is produced and sharply bidentate in the centre, its disc with a deep shining fovea, in the ♀ the ventral segments are simple, and clothed with a few long hairs; legs pitchy black, clothed with silvery hairs, the extreme base of the tibiae in the ♂ with a white spot.

L. 6-7 mm.

Folkestone; (*Lewis*). Charlton, Birch and Darent Wood, Kent; Weybridge; South Devon; Budleigh Salterton; (*Smith*). Croydon; (*Rothney*). Colchester; (*Harwood*). Bristol; (*Dale*). Bewdley; (*Marshall*). Nidificates in bramble stems.

CHELOSTOMA, Latr.

Elongate, subparallel-sided, labial palpi four-jointed, the second exceedingly long, the fourth deflected and cylindrical, paraglossæ blunt, sheath-like, maxillary palpi three-jointed, labrum elongate, subparallel-sided; wings with two submarginal cells; abdomen with the first segment without a transverse basal carina, five ventral segments exposed in the ♂, the second tuberculated or carinated, fifth with an apical fringe of long curved hairs, stipites of ♂ armature without any definite lacinia, ♀ with a dense ventral pollen brush composed of hairs with very fine filamentary branches.

The habits of this genus are interesting. The ♂ usually spends its nights curled up in flowers, but Smith says that at other times he has observed them hanging to blades of grass by their mandibles, "suspending themselves in a horizontal position with their hind legs stretched out in a

line with their bodies. A number of males thus suspended were found on a dead branch of hawthorn. They were killed by chloroform, and remained thus attached after death." The females burrow in old posts or rails, but Smith says they often employ ready-formed burrows, *florisomne* frequently using straws and reeds. *Chrysis cyanea* and *ignita* have both been bred from their nests.

C. florisomne, Linn.—Elongate, black, head and thorax closely punctured in the ♂, and rather densely clothed with long brownish-grey hairs, in the ♀ somewhat shining, the former with the vertex very large and quadrate; mandibles grooved in both sexes, simple at the apex in the ♂, bidentate in the ♀, and densely clothed in that sex with golden hairs on their inner margins, labrum in the ♀ shining and prominent, antennæ in the ♂ with the third to seventh joints angulated beneath, in the ♀ short, simple, and subclavate; wings slightly clouded; abdomen elongate deeply punctured, incurved at the apex in the ♂ and clothed with long grey hairs, and with shorter whitish hairs laterally at the apices of the segments, simple in the ♀, with a narrow apical band of white adpressed hairs on each segment, seventh segment in the ♂ with two somewhat quadrate apical teeth with a deep impression between them, segments beneath with the second produced into a large tubercle, directed towards the base, flattened and somewhat excavated on its lower surface, third excavated, and very shining, fourth densely clothed with pale hairs, fifth hairy at the base, its apex fringed with long bent hairs, each hair knotted at intervals except near the base, sixth shining, excavated, its apex rounded, seventh shining, with only a very short horny apical portion, eighth pointed at the apex, armature with the stipites apically dilated in a somewhat triangular form and fringed with remote hairs; ventral brush of ♀ dense, yellowish-white; legs clothed with pale hairs.

L. 10 mm.

Common in some localities but local. Bromley; Tunbridge Wells; Chobham; Wandsworth. Norwich; (*Bridgman*). Colchester; (*Harwood*). Exeter in straws of thatch; (*Parfitt*). Gloucestershire; (*Perkins*). Maidstone; (*Frisby*). Bury St. Edmunds; (*Tuck*). Rugby; (*Morice*).

C. campanularum, *Kirby*.—Much smaller than the preceding, black, elongate, antennæ simple in both sexes; head and thorax largely punctured, sparingly clothed with brownish-grey hairs, vertex more quadrate in the ♀; wings slightly clouded, propodeum radiately rugose at the base; abdomen largely punctured, slightly incurved at the apex in the ♂ and terminating in two blunt teeth, simple and subclavate in the ♀, segments without pubescent bands, beneath shining and punctured in the ♂, second and following segments more or less pale and membranous at the apex, the second raised in the centre, fifth with an apical fringe of long curved hairs, sixth shining and somewhat pointed, seventh membranous in the centre but hard and brown at the sides, with a few scattered hairs, eighth subquadrate, with a few very short apical hairs, armature with the stipites long and slender, slightly curved inwards towards the apex, ♀ with the underside clothed with a dense yellowish-red pollen brush; legs clothed with short pale hairs.

L. 6-7 mm.

Frequents the flowers of the Hare bell, *Campanula rotundifolia*, in June and July. Far from rare, though I have very few localities recorded for it. Chobham; Woking; Worthing; Hampton Wick. Colchester; (*Harwood*). Norwich; (*Bridgman*). Gloucestershire; (*Perkins*). Maidstone; (*Frisby*). Rugby; (*Morice*).

HERIADES, Spin.

Closely resembling *Chelostoma* generically, but labial palpi with two joints at the apex divergent and cylindrical, base

of the abdomen transversely carinated, ♂ with only two ventral segments more or less fully exposed, fifth quadrately produced on each side apically, the processes with a row of short spines along the apical margin, genital armature with the stipites long and slender, curved and convergent at the apex. Only one species is recorded from this country, and this has not occurred for very many years.

H. truncorum, *Lin.*.—Black, head and thorax very largely and rugosely punctured, clothed sparingly with brownish hairs, face rather densely with pale hairs, mandibles broad at the apex and bidentate, apical joint of the antennæ slightly flattened, wings rather clouded, scutellum dentate laterally, propodeum very short dorsally, crenulate at the apex, its apical truncature shining; abdomen with the first segment truncate at the base, with a sharp curved carina separating the truncature from the dorsal surface, truncature shining, dorsal surface of the abdomen very largely and deeply punctured and dull, first and second segments in the ♂ and all the segments in the ♀ with an apical line of white hairs, seventh segment in the ♂ inferior, second ventral segment densely hairy, third and fourth slightly emarginate, fifth denticulate or spinose at the sides, the centre submembranous apically, sixth pointed, seventh nearly entirely membranous, eighth hairy, long and tongue-like; ♀ with the scopa dense and reddish yellow; legs clothed with silvery hairs.

L. 6-7 mm.

Brentford; (*Kirby*). Dulwich; (*Ingall*). This latter locality, however, seems to me to be doubtful, as although F. Smith gives it in the second edition (1876) of his *Cat. Brit. Hym.*, &c., in the first (1855), he says, "Three or four specimens were detected in Mr. Ingall's collection of his own capturing, but he does not remember the precise locality."

CÆLIOXYS, Latr.

An inquiline genus chiefly associating with *Megachile*, which it much resembles in many points of structure. Maxillæ pointed, their palpi two-jointed, labial palpi four-jointed, the basal joints sheath-like, the apical joints divergent, very small and cylindrical, tongue elongate, not constricted at the base, paraglossæ ensheathing the base of the tongue, lateral processes parallel-sided and rounded at the apex, submentum very elongate and narrow, lora well developed, scales at the base of the maxillæ with their apices fringed with hairs, labrum elongate, sharply truncate, eyes hairy, antennæ rather short; wings with two submarginal cells, scutellum dentate laterally; abdomen truncate at the base, each segment, except the basal one, with a deep transverse impression, ♂ with the apex of the abdomen blunt, multispinose, sixth segment terminating the abdomen and anal aperture inferior in the ♂, four ventral segments exposed, the apex only of the fifth being visible, eighth segment tongue-shaped, armature with the stipites long, straight, and hairy at the apex, sagittæ as long or nearly as long as the stipites, covered by the membranous spatha; ♀ with the abdomen subtriangular, its apex more or less acute, sixth ventral segment projecting beyond the sixth dorsal, ♂ with a stout blunt spine on each of the anterior coxæ.

This is an extensive genus, occurring also in North and South Africa, North and South America, and Asia, containing many very closely allied species. The chief specific characters seem to lie in the forms and sculpture of the apical and ventral segments. There are only five British species, which may be easily distinguished by the following table.

- | | | | |
|-----|----|--|---------|
| (2) | 1. | Outer calcar of hind tibiæ blunt . . . | TECTIS. |
| (1) | 2. | Outer calcar of hind tibiæ sharp. | |
| (6) | 3. | ♂ with the fourth ventral segment
emarginate at the apex; ♀ with the
fifth ventral segment rounded at the
apex. | |
| (5) | 4. | ♂ with the fifth dorsal segment not | |

- | | | |
|--------|--|------------------------|
| | toothed laterally; ♀ with the apical ventral valve elongate and lanceolate. | QUADRIDENTATA. |
| (4) 5. | ♂ with the fifth dorsal segment toothed laterally; ♀ with the apical ventral valve short, angularly truncate at the apex | |
| (3) 6. | ♂, fourth ventral segment entire at the apex; ♀, fifth ventral segment emarginate or truncate at the apex. | RUFESCENS. |
| (8) 7. | ♂, fourth ventral segment as coarsely and remotely punctured as the second and third; ♀, sixth dorsal segment without a white pilose band, fourth ventral largely and remotely punctured | |
| (7) 8. | ♂, fourth ventral segment distinctly more finely and closely punctured than the second and third; ♀, sixth dorsal segment with a white basal band, fourth ventral closely and finely punctured | ACUMINATA.
SIMPLEX. |

C. vectis, *Curt.*.—Black, head and thorax dull, very largely and rugosely punctured, face and sides of the thorax densely clothed with ochreous hairs, disc of the latter clothed with shorter, darker hairs, mandibles bifid, wings smoky, scutellum with strong lateral spiniform teeth; abdomen shining, very largely punctured, subconical in the ♂, subtriangular in the ♀, each segment at the base with a more or less triangular patch of pale pubescence on each side, the basal segment with its sides entirely so clothed, fifth segment in the ♂ with a slightly prominent apical tooth on each side, sixth with a rather long basal spine, its apical processes each bearing a short blunt spine above and a sharp spine-like tooth below; sixth segment in the ♀ finely punctured, and narrowed to the apex, which is somewhat rounded, its disc and sides longitudinally carinated; beneath punctured, the puncturation finer as it approaches the apex, all the segments testaceous at the apex and laterally spotted with white pubescence except the basal segment which has a central spot, fourth segment in the ♂ bidentate at the apex, sixth with a corneous central rounded lobe, stipites of the armature laterally flattened, clothed

with hairs and somewhat dilated, ♀ with the fifth segment very finely punctured and clothed apically with fine brown pubescence, sixth widely lanceolate, with a slight subapical constriction; legs clothed with short whitish hairs, calcaria black, outer calcar of posterior tibiæ blunt.

L. 13-15 mm.

Isle of Wight; Sandown, flowers of bramble; Shirley; Wimbledon; Lowestoft; Morthoe, N. Devon; Yorkshire; (*Smith*). Portland; (*Dale*). Occurs in July and August. The blunt exterior calcaria of the hind tibiæ and the short triangular spots on the sides of the abdomen at once distinguish this species. *Smith* says it is parasitic on *Megachile maritima*.

C. quadridentata, *Linn.*—Black; head and thorax dull, very closely, largely, and rugosely punctured, clothed with brown hairs, the pubescence longer and denser in the ♂, wings clouded, scutellar spines short and straight; abdomen rather shining, deeply punctured, puncturation of the segments in the ♀ larger and more remote towards the apex, basal segment laterally clothed with pale hairs, in fresh examples of the ♂ the entire segment is so clothed, second and following segments each with a narrow apical band of pale adpressed hairs, fifth segment in the ♂ without lateral teeth at the apex, sixth with a narrow spiniform tooth on each side at the base, and with two apical processes, each of which, regarded laterally is bidentate, the upper tooth narrowly triangular, the lower longer and spiniform, ♀ with the sixth segment dull, finely punctured, carinated down the centre and near the apex laterally, beneath with the second and following segments fringed with pale hairs at the apex in both sexes, largely and deeply punctured in the ♂, the fourth segment narrowly emarginate in the centre, with a slight tooth on each side of the emargination, stipites of the armature straight, clothed with long hairs, shorter than the sagittæ, the apices of which are broad and distant, fourth ventral segment in the

♀ much more finely punctured than the third, fifth entire at the apex, its puncturation hardly visible, sixth longer than the dorsal valve, carinated, constricted near the apex, with its sides simply sinuate, without any indication of a lateral tooth; legs clothed with brownish grey hairs, all the calcaria sharp and black.

L. 12-13 mm.

Local. Occurs from June to August. Chobham; Woking; Hastings. Wakefield; Yarmouth; (*Smith*). Norfolk; (*Bridgman*). Bury St. Edmunds; (*Tuck*). Ipswich; (*Rothney*).

C. rufescens, *Lep.* (var., *umbrina*, *Smith*).—Very like the preceding but larger in the typical form, less densely pubescent in the ♂, the apical margin of the basal segment much more emarginate, fifth segment with a distinct lateral projection at the apex, fourth ventral segment with the emargination slightly wider, armature with the stipites narrower, slightly curved and divergent towards the apex, almost as long as the sagittæ which are much narrowed and convergent to the apex.

The ♀ differs from *quadridentata* in the more emarginate basal segment, the more shining and strongly punctured sixth segment which is slightly reflexed towards the apex, and less acuminate, the fifth ventral segment is much longer, more pointed and more strongly punctured, the sixth is short, its sides subparallel, its apex obtusely angulated.

L. 10-15 mm.

Common in some localities, occurring from June to August and very variable in size, the small variety *umbrina* used to be considered a distinct species, but it possesses no distinctive structural characters.

Chobham, associating with *Megachile circumcincta*. Bury St. Edmunds; (*Tuck*). Isle of Wight, associating with *Osmia xanthomelana*; North and South Devon; Kent; Surrey; Hants; Yorkshire and Loch Rannoch, Scotland; (*Smith*). Colchester; (*Harwood*). Norwich; (*Bridgman*).

C. elongata, *Lep. (simplex, Nyl, conica, Kirb., inermis, Kirb.)*.—Very like the other British species of the genus, but differing from either of the two preceding in the following particulars :—

♂ with a distinct lateral tooth at the apex of the fifth segment of the abdomen, sixth with the two upper apical teeth blunt and divergent so that the two lower ones which are spiniform and nearly parallel can be seen from above lying between them, the pubescent bands of the segments, narrowed towards the centre, and generally interrupted, beneath largely punctured, fourth segment more finely and closely than the third, entire at its apex, which has in its centre a smooth corneous lobe, stipites of the armature straight, clothed with long hairs at the apex, sagittæ very wide, their apices remote, slightly longer than the stipites, calcaria pale.

♀, closely resembling that of *quadridentata* the second to the fifth abdominal segments with an apical fringe of pale hairs widened at the sides, sixth dull, narrowly rounded at the apex, fourth and fifth ventral segments very finely punctured, the fifth narrowly emarginate at the apex, sixth very long, constricted near the apex with a minute tooth on each side just above the constriction, calcaria pale.

L. 12 mm.

Widely distributed and common in many places, but not recorded from Scotland or Ireland, occurs from June to August. F. Smith records it as being parasitic on *Megachile ligniseca*, *Willughbiella*, and *circumcincta*. I have taken it plentifully at Chobham together with the last named species. Mr. C. W. Dale says, "I take it on the roof of my house in company with *Osmia rufa* on which apparently it is parasitic, no *Megachile* with them." Mr. Bignell records the occurrence of a cocoon or cell of this species in a thistle head, it was in a sort of web and was given to him as a *Lepidopterous* cocoon, but out of it he bred a specimen of this species.

C. acuminata, *Nyl.*—Difficult to distinguish from *elongata*, but the ♂ has the apical teeth of the fifth segment more spiniform, the upper apical spines of the sixth less blunt and more divergent, the fourth ventral segment as largely and remotely punctured as the third, armature with the stipites longer than the sagittæ which are less remote at the apex.

♀ with the fifth abdominal segment destitute of an apical fringe, the sixth rather longer and more pointed, the bands of the other segments more widely interrupted, fourth ventral segment largely and clearly punctured, although less coarsely than the third, the sixth segment is rather longer, the constriction less marked and proportionately nearer the apex.

L. 12 mm.

Rarer than the preceding, occurring in July and August. Woking; Chobham; Hastings; Deal; Southwold. Norwich; (*Bridgman*). Bury St. Edmunds; (*Tuck*). Colchester; (*Harwood*). Wallasey Sandhills; (*Gardner*). Plymbridge, Devon; (*Bignell*). Scotland; (*Service*).

MEGACHILE, Latr.

The bees of this genus are black, more or less densely clothed with brown pubescence on the head and thorax, and sometimes also on the abdomen, the head is large, sometimes as wide as the thorax, eyes not hairy, mandibles large, more or less flattened, and grooved, angularly produced at the base beneath in the ♂, antennæ with the apical joint more or less flattened, labrum elongate and truncate, maxillæ and mouth organs much as in *Colioxys*; scutellum simple, not spinose; wings with two submarginal cells, abdomen truncate, and slightly emarginate at the base, the sixth segment in the ♂ terminating the abdomen, and bearing a well-marked, transverse apical

crest, the actual apical margin is on the ventral side of the abdomen; seventh dorsal segment inferior, the eighth dorsal hidden in the seventh; four ventral segments only visible, fifth with a more or less rugose patch in the centre near the apex, sixth very short, clothed along the middle with spine-like, often recurved, or apically dilated hairs, apex of the segment often produced into a membranous wing, seventh so fragile and membranous that I have been unable to extract it entire, eighth narrow and tongue-like, armature very large at the base, the stipites more or less divergent, sagittæ convergent and pointed, except in *argentata*, where both stipites and sagittæ are subparallel; ♀ with a dense ventral pollen brush, formed of straight, spirally grooved hairs; anterior coxæ in the ♂ each with a long, thick, blunt spine, and the anterior tarsi sometimes widely dilated. There are seven British species of this cosmopolitan genus; they burrow in old posts, stumps of trees, or banks, the same species sometimes being found in banks, sometimes in dead wood; they all line their burrows with pieces of leaves or flowers, which they cut out in a more or less oval form from various plants, the cells are closed at the top by two or three circular pieces of leaf, placed one over the other, these pieces of leaf are cut out by the ♀ by means of her mandibles, the bee holding on to the edge of the leaf by her legs until the piece is completely severed, the bees may often be seen flying away with their green burden, looking like flying leaves.

The specific characters of the members of this genus lie chiefly in the anterior tarsi, the ventral segments and armature of the ♂, in the mandibles, the colour of the scopa, &c., in the ♀. The British species may be thus tabulated:—

- (6) 1. ♂, front tarsi dilated, white; ♀, mandibles flat, deeply furrowed, the furrow extending from between the

- apical and subapical teeth almost to the clypeus.
- (3) 2. ♂, posterior tibiæ much dilated, wider than the femora, posterior tarsi very wide, the intermediate joints transverse.
♀, abdominal segments with an entire apical fringe of pale fulvous hairs on each MARITIMA.
- (2) 3. ♂, posterior tibiæ not thicker than the femora, posterior tarsi not very wide; the intermediate joints not transverse.
♀, some of the abdominal segments without entire apical pubescent bands.
- (5) 4. ♂, anterior metatarsi not nearly twice as long as wide; their sides slightly curved, apical joint with a tuft of long hairs at the side.
♀, abdomen clothed with scattered fulvous hairs at the base, the segments more or less banded at the apex with pale hairs WILLUGHBIELLA.
- (4) 5. ♂, anterior metatarsi twice as long as wide, parallel sided; apical joint without lateral hairs.
♀ abdomen clothed with long, fulvous hairs at the base, with black at the apex, unbanded CIRCUMCINCTA.
- (1) 6. ♂, front tarsi not dilated, ♀, mandibles more convex, the furrow short, not extending nearly to the clypeus.
- (14) 7. ♂, sixth abdominal segment not clothed with pale hairs; scopa of ♀ not white, apices of ventral segments naked.
- (11) 8. ♂, sixth segment widely and distinctly emarginate at the apex; ♀, scopa not bright orange.
- (10) 9. ♂, seventh segment spined, ♀, scopa entirely pale ERIGETORUM.
- (9) 10. ♂, seventh segment simple, ♀, scopa black at the apex LIGNISECA.
- (8) 11. ♂, sixth segment simple, or with a very slight apical notch.
♀, scopa bright orange.
- (13) 12. ♂, fringes of ventral segments sparse; ♀ scopa black at the apex VERSICOLOR.
- (12) 13. ♂, fringes of ventral segments dense and white; ♀ scopa bright orange throughout CENTUNCULARIS.

- (7) 14. ♂, sixth abdominal segment clothed with white hairs; ♀ scopa white; apices of ventral segments fringed. ARGENTATA.

M. maritima, Kirby.—Black, head and thorax closely punctured, face in the ♂ densely clothed with pale ochreous hairs, mandibles in the ♂ whitish towards the apex beneath, in the ♀ largely flattened, so as to be on the same plane with the clypeus, with a long, deep groove, extending from between the apical and subapical teeth almost to the base, apical joint of the antennæ in both sexes compressed, and in the ♂ somewhat dilated; thorax clothed with fulvous brown hairs, paler and brighter in the ♂, wings with a slight apical cloud, mesopleuræ and propodeum with paler hairs; abdomen closely and finely punctured, with deep, transverse impressions in both sexes, each segment in the ♂ densely clothed with erect, fulvous hairs, the hairs of the apical segments more dusky; ♀ with the first and second segments clothed with erect, pale hairs, the rest with brownish or black; all the segments in both sexes with entire apical bands of short, pale hairs; apical crest of the sixth segment in the ♂ narrowly emarginate, and deeply foveated at the base of the emargination, both dorsally and ventrally, actual apex of sixth segment largely and semicircularly emarginate, its lateral angles prominent, seventh segment with its apex truncate; ventral segments finely punctured, first, second, and third densely clothed at the apex and sides with long, pale hairs, fourth with its apical margin pale, submembranous and truncate, fifth with a suboval, pale, rugose, central patch, extending to the base, and slightly overlapping the posterior margin of the segment, sixth very short, submembranous, except laterally, the centre produced into a narrow, truncate wing, its angles acutely produced at the sides, on each side of the segment is a patch of hairs or spines, with curiously reflexed apices, seventh so thin that I have been unable

to remove it; eighth small, tongue-like, armature with the stipites bifid at the apex; ♀ with a dense pollen brush, composed of nearly white hairs at the base, of pale, yellowish-red in the centre, and black at the extreme apex; legs clothed with golden-brown hairs in both sexes; ♂ with the front coxæ spinose, each spine terminating in a pencil of hairs, the anterior femora and tibiæ pale in front and beneath, the latter pale at the apex, and with a deep semicircular, lateral emargination near the apex outwardly; anterior tarsi white, much dilated, densely fringed with pale, golden hairs, which are brownish at the extreme apex, second joint with an oblong, brown spot near its lower margin, posterior femora slightly thickened, the posterior tibiæ very much dilated and curved; tarsi dilated in both sexes, ♀ with the anterior tibiæ deeply emarginate near the apex outwardly, legs otherwise simple.

L. 14–15 mm.

Generally distributed along our coasts, and occasionally found inland, but not recorded from Scotland or Ireland; it occurs in July and August.

M. Willughbiella, *Kirby*.—Slightly smaller than the preceding, and differing in the following points:—

♂ with the pubescence less brightly coloured, and that of the abdomen less dense; mandibles with a small, red spot near the apex beneath; apical crest of the sixth dorsal segment more deeply and widely notched, and sometimes denticulate at the sides, and without a central fovea; seventh segment just visible, and armed with a central tooth, seen through the emargination of the sixth, sixth ventral segment angularly produced in the centre of its wing, as well as laterally, apices of stipites not bifid, but bent outwards; front tibiæ pale anteriorly only at the apex, which has no lateral semicircular emargination, but has a blunt pencil of dark hairs at the inner angle, tarsi with the second joint not spotted beneath, posterior tibiæ not

thicker than the femora, tarsi with the joints not dilated, longer than wide.

♀ very like that of *maritima*, but with the mandibles more rugose, and less shining, the groove less strongly marked, and shorter, the apical tooth less produced, but more acute; abdomen less closely and regularly punctured, transverse impressions deep, the pale apical bands less wide and dense, entire only on the fourth and fifth segments, scopa red, the hairs of the fifth and sixth segments black; anterior tibiae scarcely emarginate near the apex.

L. 12-14 mm.

Common, and generally distributed; makes its burrows in willow trees, and occurs from June to August.

M. circumcincta, *Lep.*—Closely allied to the two preceding, but easily distinguished by the following characters:—

In both sexes the pubescence is of a brighter brown, and rather more abundant.

The ♂ has the mandibles entirely black, except the extreme piceous apex, and produced beneath into a rather more prominent triangular basal tooth; abdomen clothed on the first three segments with long, pale, brown hairs, on the apical segments with black, crest of the sixth segment deeply emarginate, seventh with a strong central tooth, sixth ventral segment with its apical wing less produced at the lateral angles, armature with the stipites straight, not bent outwards at the apices, the sagittæ suddenly convergent near the apex; anterior coxal spines without apical pencils of hairs, anterior femora pale and concave in front, tibiae paler at the apex, anterior metatarsi less dilated, and less densely fringed than in *Willughbiella*, parallel sided, second joint with a black spot beneath, apical joint glabrous at the sides; posterior metatarsi shorter, and more parallel sided than in *Willughbiella*.

♀ hairs of the face black, mandibles flat, shining, largely punctured, groove very long and deep, pubescence

of the abdomen as in the ♂, segments without pale, apical lines of pubescence, and with only very shallow, transverse basal impressions, scopa beneath dark orange-red, black on the apical and penultimate segments.

L. 12-14 mm.

Not rare, but local; occurs in June, July, and August (last year, 1893, the ♂ occurred as early as April!) on sandy commons, burrowing in banks, &c., usually lining its burrows with rose leaves. I take it commonly at Chobham and Woking. Hampshire commons; (*Smith*). Colchester; (*Harwood*). Parley Heath; (*Dale*). Rugby, in willow trunks; (*Morice*). Tor Cross; Slapton; (*Bignell*). Lancashire and Cheshire; (*Gardner*). Perth; (*McGregor*). Norfolk; (*Bridgman*).

M. ligniseca, *Kirby*.—Black, head and thorax finely and closely punctured, clothed above with dull fulvous brown hairs, mixed with black on the vertex and the disc of the thorax, with paler hairs beneath; face with brighter more golden pubescence, especially in the ♂, apical joints of the antennæ not dilated, ♀ with the mandibles flattened so as to be on the same plane with the clypeus only near their cutting edge; wings slightly dusky; abdomen finely punctured, sparingly clothed with pale hairs on the first three segments, with black on the rest, pubescence of the apex of the third in the ♂ also black, the segments deeply impressed transversely in both sexes and with a more or less distinct apical fringe of paler hairs, ♂ with the apical crest of the sixth segment deeply and widely emarginate, the base of the segment on each side with an unciform tooth, seventh segment with its apex narrowly emarginate, visible ventral segments clothed with pale whitish hairs in the ♂, scopa in the ♀ ochraceous, black at the apex, sixth ventral segment in the ♂ without an apical wing, stipites of the armature straight, shorter than the sagittæ, their apices with a lateral tuft of long hairs; legs clothed with greyish-fulvous hairs, anterior coxæ and tarsi simple in both sexes, base of the

claws in both sexes and the apices of the anterior tarsi in the ♂ testaceous.

L. 12-18 mm.

Not a common species, it makes its burrows in wood, according to Smith preferring wood that is more or less decayed. Occurs in the summer from June to August, generally on Thistles. Woking; Chobham; Surbiton; Blackheath. Richmond; Hampton Court; Windsor; (*Smith*). Norfolk; (*Bridgman*). Bury St. Edmunds; (*Tuck*). Colchester; (*Harwood*). Glanvilles Wootton; (*Dale*). Hastings; (*Frisby*). Edgbaston; Leicester; (*Marshall*).

M. ericetorum, *Lep?* (*pyrina*, *Smith nec Lep.*).—"♀. Black; the face on each side has some rich yellow pubescence, that on the vertex is black. Thorax: the pubescence on the disk short, sparing, and black, that on the sides and beneath pale fulvous, the metathorax has a short pale pubescence; the apical joints of the tarsi are ferruginous; the wings subhyaline their apical margins clouded. Abdomen: the two basal segments thinly clothed with pale fulvous pubescence, on the following segments it is short and fuscous, all the segments have a fascia of short fulvous pubescence; beneath, entirely and densely clothed with a golden yellow pubescence."

L. 5-6 lines.

"♂. The face clothed with bright pale yellow pubescence, the antennæ filiform, the cheeks densely bearded with cinereous pubescence. Thorax: the pubescence on the disk pale ochraceous, on the sides and beneath it is long, dense and cinereous; the tarsi bright ferruginous; the anterior coxæ have a short acute spine. Abdomen: the base and sides have a long pale pubescence, on the third and following segments it is short and fuscous, the apex incurved the margin of the sixth segment emarginate in the middle and denticulate at the sides, the seventh has a short acute spine in the middle"

L. 5 lines.

Although through the kindness of Dr. Mason I have been able to examine the original specimens of this species taken by F. Smith at Weybridge in 1844, I have refrained from redescribing it, as the specimens are much faded; I have, therefore, thought it is better to copy out Smith's description from the first edition of his "Catalogue of British Hymenoptera"—"Apidæ," 1855, p. 177. In the second edition he also gives Southampton and Bristol as localities for it, but on whose authority I do not know.

M. centuncularis, *Linn.*.—Black; smaller than any of the preceding, head and thorax closely punctured, clothed with golden brown hairs, more or less mixed on the vertex and disc of the mesonotum with black, hairs of the face more brightly golden, especially in the ♂, apical joint of the antennæ not dilated, mandibles in the ♀ convex, flattened only as in *ligniseca*; wings slightly dusky; abdomen closely punctured, subcordate in the ♀, segments deeply impressed in the ♂, less deeply in the ♀, first and second clothed with pale, the rest with erect black hairs, all the segments with paler apical bands, those of the ♀, except that of the fifth, widely interrupted, sixth segment in the ♂ with the apical crest scarcely and rarely emarginate, its base with a narrow unciform spine on each side, seventh unarmed, second and third ventral segments of the ♂ densely fringed at the apex with pale hairs, fourth produced, rather narrowly truncate at the apex, with a distinct transverse ridge beyond the middle, fifth with a semicircular pubescent area which does not nearly reach to the base, sixth very short without any apical wing, armature with the stipites shorter than the sagittæ, which latter are much attenuated and touch each other at the apex; scopa of ♀ entirely bright orange-red, the hairs projecting beyond the sides of the abdomen so as to present the appearance of a fringe; legs clothed with pale hairs, anterior coxæ and tarsi simple in both sexes.

L. 10–12 mm.

The commonest species of the genus and generally dis-

tributed. It sometimes burrows in the ground, but generally in wood. Smith says he has also seen it entering holes in walls; it occasionally lines its burrows with the petals of Scarlet Geraniums.

M. versicolor, *Smith*. Closely resembling *centuncularis* in the ♂ and slightly in the ♀; it is, however, perfectly distinct by the following characters:

♂ with less distinct lateral abdominal bands, the second and third ventral segments with much less dense apical fringes, truncature of the apex of the fourth much wider, fifth shorter, the semicircular area reaching to its base, armature with the sagittæ less attenuated and less convergent, their apices not nearly touching.

♀ with the abdomen blunt posteriorly as in the earlier species, not subcordate as in *centuncularis*, sixth dorsal segment without erect black hairs, the others with scarcely any indications of lateral bands; scopa bright orange, with the hairs of the fifth and sixth segments black.

L. 10-13 mm.

I am very glad to reinstate this species as I ought never to have omitted it from our list. The specimen I had (named *versicolor* by Smith) was only a worn *Willughbiella* or *circumcincta*, this fact, I am afraid, led me to jump to the conclusion that his *versicolor* was nothing but a var. of one of these, especially as the ♂ was unknown; a few years ago the Rev. F. D. Morice caught a ♀ at Woking, which we made out to be quite distinct from any other of our species, and finally referred it with certainty to *versicolor*, Smith; several similar females were found here, but still no males, and I felt disinclined to reinstate it on the one sex only. This spring, however, I had the great satisfaction of finding both males and females on the flowers of *Lotus corniculatus* in the same locality where the females had occurred previously. I can find no mention of this species as occurring on the Continent. The species has also occurred at Bury St. Edmund's, where Mr. Tuck captured a

♀ which had made its burrow in an old Broom stump; he was good enough to send me the stump with the burrow in it, but the bees never came to perfection, the burrows were lined with rose leaves; last autumn he procured another stump for me, from which I have bred both sexes; at Woking it burrows in the sand. Smith records it from Weybridge; Bournemouth; Bristol; Carlisle. The ♂ last year (1893) appeared in May, but probably June would be its usual time; I have taken the ♀ as late as September.

M. argentata, Fab. (*Leachella*, Curt.).—The smallest British species of the genus; black, head and thorax closely punctured, densely clothed with greyish-golden hairs, the former in the ♂ sometimes wider than the latter, mandibles clothed with grey hairs, apical joint of the antennæ in the ♂ flattened and very slightly dilated; wings slightly clouded; abdomen closely punctured, the first three segments in the ♂, the first two in the ♀, clothed with erect greyish-golden hairs, the rest with shorter, black hairs, all the segments in both sexes with well-defined pale apical fringes, sixth segment in the ♂ densely clothed with ochreous hairs except at the apex, the apical crest irregularly spinose at the sides, and emarginate in the centre; ventral segments in the ♂ fringed with long white hairs, sixth without an apical wing, stipites of armature looked at from above slightly curved, looked at laterally bifid at the apex, the upper tooth narrow and pointed, sagittæ flattened at the sides, subtruncate at the apex; ♀ with the scopa silvery white, posterior margins of the segments fringed with fine hairs; legs clothed with white hairs, ♂ with the posterior concavity of the anterior femora, and the anterior tibiæ at the back, testaceous, base of the claws testaceous in both sexes.

L. 9—11 mm.

Common in some parts of the coast and occasionally found inland; occurs in July and August, and according to Smith often lines its burrows with the petals of *Lotus*

corniculatus, the burrows are formed in the sand. Littlehampton; Hayling Island. Deal; Land's End; Southend; Weybridge; Burnham, Somerset; (*Smith*). Chesil Beach; Lulworth; Sandown; (*Dale*). Exmouth; (*Parfitt*). Hastings; (*Frisby*). Ramsgate; (*Marshall*).

OSMIA. Panz.

The various members of this genus differ very considerably in structure, especially in the ♂ sex. Tongue very long, the paraglossæ with an elongate sclerite along the lateral margin of the basal portion and produced at the apex into an elongate blunt process, labial palpi four-jointed, the third and fourth very short, cylindrical and divergent, maxillæ rather long and narrow, their palpi four-jointed, their basal scales well developed, submentum very long and narrow, lora well developed, labrum elongate, parallel sided, antennæ in the ♂ considerably longer than in the ♀, vertex in the ♀ often large and subquadrate; wings with two submarginal cells, scutellum simple or dentate at the sides; abdomen short in the ♀, with a ventral pollen brush, its hairs simple; very variable in the ♂, especially in the form of the ventral segments, and in the number exposed to view, anal opening inferior, armature with the stipites very elongate, without lacinia, curved or angularly bent inwards at the apex, hairy and sometimes dilated at the bend outwardly, sagittæ long and straight, convergent at their apices, usually united by a membrane throughout their length; tarsi often affording useful characters in the ♂.

This is a very extensive genus; Schmiedeknecht (*Apidae* Europæ) enumerates no less than eighty-eight European species, of which ten have occurred in this country, Smith gives N. Africa, and North America as other habitats, and remarks that the genus is confined apparently to temperate climates. In diversity and ingenuity of habits *Osmia* stands very high among the *Apidae*. *Rufa*, our commonest species,

will either make its burrows in the ground, in trees, in snail shells, or in old walls, or locks, and once as mentioned by Smith, constructed as many as fourteen cells in an old fife that had been left on a shelf in a garden arbour. Personally I have had very little opportunity of noticing the habits of *Osmia*; as in a sandy district like Woking this genus does not abound, but the records of the methods employed by the species which utilize old snail shells as burrows, show a power of adaptation to circumstances which appears almost rational. In comparatively small whorled shells such as *Helix nemoralis* the cells are formed in single file, but if the shell selected be one of the common garden snail, *H. aspersa*, or of the larger *H. pomatia*, the cells will be laid several abreast towards the mouth, the bee apparently suiting the number of cells to the circumference of the tube; species of this genus have been known to utilize straws and reeds, whilst *leucomelana* as a rule burrows in bramble stems, although in this neighbourhood (Woking) it burrows in the ground, the larvæ when full fed, spin a cocoon, usually of a dark brown colour, in this they will sometimes remain through one or more winters in the larval state; in the case of *O. parietina* some cocoons received in 1849 produced perfect insects in 1852. Of such as burrow in posts, Smith gives the following interesting particulars. "She commences the formation of her tunnel, not by excavating downwards, as she would in that case be incommoded with the dust and rubbish which she removes; no, she works upwards, and so avoids such inconvenience. When she has thus proceeded to the length required she proceeds in a horizontal direction to the outside of the post; and now her operations are conducted downwards, she constructs a cell near the bottom of the tube, a second and a third and so on to the required number; the larvæ when full fed have their heads turned upwards, the bees which first arrive at their perfect condition are the males, and it is these that are first anxious to escape; they usually do so several days

before the females. This is the history of every wood-boring bee that I have bred; and I have reared broods of nearly every species indigenous to this country." The peculiarities in habits of the species will be shortly noticed at the end of the descriptions. Chrysis occurs as a parasite on *Osmia*.

- | | | | |
|------|-----|--|---------------|
| (2) | 1. | ♂, antennæ very long, not hairy, extending to beyond the scutellum; ♀ with two stout horn-like processes on the face | RUFA. |
| (1) | 2. | ♂, antennæ either fringed with fine hairs beneath or else not nearly reaching to the scutellum; ♀ face simple. | |
| (12) | 3. | Calcaria of posterior tibiæ black. | |
| (9) | 4. | Abdomen black, not metallic. | |
| (8) | 5. | ♂, posterior metatarsi, more or less dilated towards the apex inwardly, apex of abdomen bidentate; ♀, face with black hairs, first and second abdominal segments clothed with fulvous hairs. | |
| (7) | 6. | ♂, antennæ fringed with fine hairs beneath; ♀, face sparingly clothed with black hairs, basal area of propodeum dull | PILICORNIS. |
| (6) | 7. | ♂, antennæ not fringed beneath; ♀, face densely clothed with black hairs, basal area of propodeum shining | XANTHOMELANA. |
| (5) | 8. | ♂, posterior metatarsi simple, apex of abdomen entire; ♀, face clothed with pale hairs, basal segment only of abdomen with fulvous | PARIETINA. |
| (4) | 9. | Abdomen more or less metallic. | |
| (11) | 10. | ♂, posterior metatarsi simple; ♀, scopa black | CERULESCENS. |
| (10) | 11. | ♂, posterior metatarsi toothed beneath; ♀ scopa red | FULVIVENTRIS. |
| (3) | 12. | Calcaria of posterior tibiæ pale. | |
| (14) | 13. | ♂, margin of sixth segment entire; ♀, head and thorax densely clothed with black hairs | BICOLOR. |
| (13) | 14. | ♂, margin of sixth segment denticulate at the sides; ♀, head and thorax clothed with brown or pale hairs. | |
| (16) | 15. | Segments of abdomen fringed with golden hairs | AURULENTA. |
| (15) | 16. | Segments of abdomen not fringed with golden hairs. | |

- (18) 17. ♂ with a sharp tooth on the basal segment beneath; ♀, scopa fulvous SPINULOSA.
 (17) 18. ♂ with a broadly-elevated tubercle on the second segment beneath; ♀, scopa greyish LEUCOMELANA.

O. rufa, *Lin.* (*bicornis*, *Kirb.*).—♂ much smaller than the ♀. Head and thorax greenish black, in both sexes, closely and finely punctured, clothed with pale brownish hairs above, with paler beneath, face of the ♂ with white, face of the ♀ with black hairs, antennæ in the ♂ long, reaching to the scutellum, not fringed with hairs beneath, clypeus in the ♀ with a large horn-like process on each side, more or less bifid at its apex, the inner tooth produced and slightly bent towards the centre, mandibles deeply grooved and rugosely punctured; wings slightly clouded; abdomen more or less bronzy, punctured, densely clothed with orange coloured hairs, which are longer and brighter in the ♂, seventh segment in the ♂ narrowly truncate, second ventral segment very long, punctured, rounded at the apex, third visible only at the sides, its apical margin widely emarginate, fourth with its apical margin rounded and slightly reflexed, fifth just visible at the apex, sixth hidden, slightly pointed, seventh corneous only at the sides, the centre entirely membranous, eighth narrowly pointed, armature with the stipites and sagittæ long and straight, the former dilated just before the apex, and hairy, and then attenuated, ♀ with the scopa orange coloured, legs clothed with brownish grey hairs, tibiæ and tarsi with orange.

L. 10–15 mm.

Very common and generally distributed; the pubescence soon fades into a dingy grey; this species, as mentioned in the remarks on the genus, is most variable in its habits of nesting.

O. pilicornis, *Smith.* (*faciformis*, *Smith.*).—Black, head and thorax closely punctured, clothed in the ♂ with grey hairs slightly tinged with brown, face in the ♀

clothed with black hairs, vertex and thorax with bright fulvous brown; antennæ in the ♂ long, reaching to the propodeum, fringed beneath with fine hairs; wings slightly dusky, nervures brown, basal area of the propodeum dull; abdomen rather shining, closely and rugosely punctured, clothed in the ♂ with greyish hairs, with a more or less fulvous tint towards the apex, in the ♀ with fulvous hairs on the first and second segments, and with black on the others, posterior margins of the segments bright and impunctate in the ♂, finely rugulose in the ♀, sixth segment sharply emarginate in the ♂, seventh very deeply so; beneath, with the second segment very long, slightly concave, its apical margin much produced in the centre, where there is a slight emargination, third visible only at the sides, fourth somewhat truncate at the apex, its disc clothed with hairs, which have their apices hook shaped, armature with the stipites narrowed and convergent at the apex, with no lateral dilatation, the sides of the narrowed portion fringed with hairs, sagittæ very narrow, much shorter than the stipites; ♀ with the scopa black; legs clothed with grey hairs in the ♂, with black in the ♀, posterior metatarsi of the ♂ widened at the apex inwardly, of the ♀ simple, about twice as long as wide.

L. 9-10 mm.

Local; Guestling near Hastings on *Ficaria*; Leigh Woods, Durdham Downs, Bristol; Birchwood, Kent; (*Smith*). Colchester; (*Harwood*). Oxford and Chippenham; (*R. C. L. Perkins*). Shirley; (*Rothney*). Wotton-under-Edge; (*V. R. Perkins*). Lowestoft; Devon; (*Parfitt*). Norfolk; (*Bridgman*). Perth. This species, according to Mr. R. C. L. Perkins' observations, makes its burrows in dead wood.

O. xanthomelana, *Kirb.* (*atricapilla*, *Curt.*; *tunensis*, *Kirb.* ♂ only.)—Larger than the preceding, head and thorax closely punctured, densely clothed above with bright fulvous hairs, face and underside of the ♀ with black, face of the ♂ below the antennæ with nearly white hairs, antennæ of

the ♂ reaching to about the tegulæ, and not pilose beneath; wings clouded, especially over the marginal cell, nervures very dark, propodeum with the disc of the basal area shining; abdomen rather shining, finely and closely punctured, clothed in the ♂ entirely with bright fulvous hairs, first and second segments in the ♀ with fulvous, the rest with black, the apical margins of the segments in both sexes shining and impunctate, sixth segment in the ♂ slightly emarginate, seventh segment deeply so; second ventral segment clothed with black hairs, its posterior margin angulated in the centre, the third emarginate, the emargination fringed with fulvous hairs, fourth rounded apically, clothed with hairs recurved at the apex, fifth only visible at the extreme sides, armature with the stipites largely dilated near their apices, which are then narrowed and rapidly convergent, the dilatation clothed with bristly hairs; ♀, scopa dense and black, with fulvous reflections in certain lights; legs of the ♂ clothed with fulvous grey hairs, of the ♀ with black, intermixed with fulvous, posterior metatarsi of the ♂ produced inwardly into a distinct tubercle, in the ♀ simple, longer than in *pilicornis*.

L. 12 mm.

Local; appears in the end of April or early in May, and forms its nests, according to Smith, usually at the roots of grass; "the cells are pitcher shaped, and constructed of mud mixed with small pebbles, the cells are rounded at the bottom, but flattened at the top, and closed by a lid; a nest, when completed, usually contains five or six cells." Somersham near Ipswich; (*Kirby*). Darenth Wood; near Liverpool; Bristol, on *Glechoma hederacea*; Eastbourne; Exeter; (*Smith*). Isle of Wight; (*Rothney*). Sandown, Isle of Wight; (*Dale*). Gloucestershire; (*Perkins*).

O. parietina, *Curt.*—About the size of *pilicornis*, but easily known from that species by the fulvous haired thorax, and short antennæ of the ♂, and the pale haired

face of the ♀; from *xanthomelana* by the smaller size, and the dull basal area of the propodeum of both sexes, the black haired abdomen of the ♂, and the pale haired face of the ♀; the abdomen is very short in both sexes, and the basal segment only is fulvopubescent, seventh segment deeply notched in the ♂, second ventral segment narrowly emarginate in the centre, third visible only at the sides, fourth hairy at the apex, stipites not dilated outwardly, but slightly widened on the inner margin before the apical attenuation, scopa black in the ♀; posterior metatarsi with a small spine beneath in the ♂.

L. 8 mm.

This little species appears in June, and has occurred only in the North, and in Wales; Ambleside, Westmoreland; Loch Rannoch; Grampian Hills; Bridgend, Glamorgan-shire; (*Smith*). Near Ruthin, Denbighshire; (*Gardner*). The cocoons of this species, according to Smith, are attached to the lower surface of stones which have a hollow space beneath them, he once had a stone with 230 cocoons under his observation, the bees from some of the cocoons did not emerge for three years after the stone was found.

O. cærulescens, *Linn.* (*ænea*, *Smith*, *cyanea*, *Fab.*). Head and thorax closely punctured, bronzy, slightly shining and clothed with fulvous hairs in the ♂, blue-black, dull, and clothed with greyish hairs in the ♀, antennæ in the ♂, reaching to beyond the tegulæ; wings slightly dusky, propodeal area shining; abdomen short in both sexes, and closely punctured, rather shining, bronzy in the ♂, sparingly clothed with pale fulvous hairs, blue in the ♀ sparingly clothed on the disc, and more densely at the sides, with greyish hairs, the pubescence in both sexes forming more or less distinct bands at the apices of the segments, especially on the fourth and fifth in the ♀, sixth segment in that sex entirely clothed with adpressed grey hairs, sixth in the ♂ nearly entire, or with a nearly obsolete apical emargination, seventh bidentate, second ventral segment largely

rounded posteriorly, third emarginate, its emargination fringed with long hairs, fourth and fifth entire, armature with the stipites long and subparallel, convergent at the apex so as partly to enclose the sagittæ, ♀ with the scopa black; legs clothed with very pale brownish hairs, in the ♂, with grey in the ♀, calcaria black, posterior metatarsi beneath, without a spine or tubercle.

L. 7-10 mm.

Common and generally distributed, occurring from May to August. It generally burrows in old posts, &c., but occasionally in hard banks, or old walls. In my Synopsis Trans. Ent. Soc., 1884, p. 208, I see now, for the first time, that I represented the propodeal area of this species as being "dull," how I could have made this mistake I cannot imagine, as its shining area is the character by which it is known from several of its Continental allies.

O. fulviventris, Panz. (*Leaiana*, Kirb.).—♂ exceedingly like that of the preceding species, but rather larger, thorax more obscurely metallic, and duller, the puncturation being closer, wings rather more smoky, especially in the marginal cell; abdomen slightly longer, the sixth segment distinctly emarginate, armature with the stipites less parallel, gradually narrowed to the apices which are less convergent, and do not in any way enclose the sagittæ; posterior metatarsi with a spine beneath, this is not very easy to see, as it projects in the middle of the dense bristly hairs which clothe the underside of the joint.

♀, head and thorax dull, closely punctured, greenish black, sparingly clothed with greyish fulvous hairs, wings smoky brown, propodeal area shining, abdomen shining, largely, and not very closely punctured, except on the fourth and fifth segments, black with bluish or greenish reflections, almost glabrous above, the sides fringed with orange yellow hairs, sixth segment clothed with adpressed greyish hairs, beneath with the scopa bright orange, legs clothed with pale hairs, calcaria black.

L. 9-10 mm.

Tolerably common, and generally distributed, though not recorded from Ireland, it makes its burrows in old posts, &c. Mr. R. C. L. Perkins says that this is a leaf-cutting bee, but that it only cuts the yellow (slightly decayed) leaves, and is less expert than *Megachile*, as it cuts them all in jaggs; occurs in June, July, and August, and is very partial to the flowers of Thistles.

O. bicolor, *Schrank*.—Black, head and thorax closely punctured, clothed in the ♂ with ochreous yellow hairs which soon fade to grey, in the ♀ with black; third joint of the antennæ longer than the two following together, wings slightly smoky, especially towards the apex in the ♀, propodeal area dull; abdomen finely and closely punctured, clothed with ochreous yellow hairs in the ♂, with bright red in the ♀, seventh segment in the ♂ sharply bidentate, beneath closely punctured, clothed with pale hairs, second segment with a raised central line, third angularly emarginate, fourth with a hairy tubercle near the centre of the apical margin, fifth truncate, sixth shining, with a tuft of golden hairs on each side of its apex, armature with the stipites unusually stout, somewhat elbowed near the middle, their apices subtruncate and hairy, ♀ with the ventral scopa red; legs clothed with ochreous yellow hairs in the ♂, in the ♀ with black hairs on the femora, brown on the tibiæ, and bright fulvous red on the tarsi, posterior metatarsi in the ♀ and the apical joints of all the tarsi in both sexes clear testaceous, calcaria pale.

L. 10–12 mm.

Local, but not uncommon where it occurs. It seems to prefer limestone and chalky districts, appearing towards the end of April or the beginning of May, making its nests in banks or snail shells. Reigate; Bristol; Northfleet; Purfleet; (*Smith*). Riddlesdown, near Purley; (*Rothney*). Chippenham; Oxford; (*R. C. L. Perkins*). Wotton-under-Edge; (*V. R. Perkins*). Maidstone; (*Frisby*). Colchester; (*Harwood*). Parley Heath; Cranborne; (*Dale*). Near

Ruthin, Denbighshire; common in May, 1891, none in 1892; (*Gardner*).

Mr. V. R. Perkins, Ent. Mo. Mag., xxvii. p. 193, gives an interesting account of his discoveries respecting the nest-making methods of this little bee in his neighbourhood. He says that after filling a snail shell with its cells, it covers it up with short pieces of "bents" until a little mound is formed two or three inches in height, and "from four to six inches round the bottom," somewhat resembling a nest of *Formica rufa* in miniature, each mound containing hundreds of pieces.

O. aurulenta, *Panz. (tunensis, Kirb. ♀)*.—Black, with a slight metallic tint in the ♂, head and thorax closely punctured, clothed in the ♂ with greyish hairs tinged with fulvous, in the ♀ with bright fulvous, paler on the face and underside; wings slightly dusky, especially across the top of the marginal cell, propodeal area dull; abdomen slightly shining, closely punctured, clothed with greyish hairs in the ♂, with short fulvous in the ♀, the second and following segments with apical bands of golden hairs, those of the third and following wider and denser in the ♂, sixth segment in the ♂ dentate and sinuate at the sides, slightly rounded at the apex, seventh sharply bidentate; beneath punctured, third segment visible at the apex, emarginate, the emargination fringed with long golden hairs, fourth segment entire, rather angular at the apex, fifth sinuate, sixth entire, stipites of armature narrow, slightly dilated and convergent at the apices, nearly enclosing the sagittæ; ventral scopa of ♀ red; legs clothed with greyish hairs in the ♂, with fulvous in the ♀, calcaria pale.

L. 9–11 mm.

Deal; Herne Bay. Dover; (*Marshall*). Isle of Wight; (*Rothney*). Wotton-under-Edge; (*V. R. Perkins*). Dartmouth; (*R. C. L. Perkins*). Yorkshire; Llanberis; Bristol; (*Smith*). Slapton, bred from whelk shells; (*Bignell*). Wallasey, breeding in snail shells; (*Rev. H. H. Higgins*).

This species sometimes burrows in the ground and sometimes makes its cells in shells.

O. leucomelana, Kirby (*claviventris*, Thoms.).—Black, head and thorax closely punctured, densely clothed in fresh examples of the ♂ with fulvous brown hairs, sparingly in the ♀ with very pale fulvous hairs on the upper surface, with greyish white beneath, but soon fading in both sexes to a uniform grey, wings slightly smoky, propodeal area somewhat shining towards the apex; abdomen rather dull, closely punctured, and clothed with short brown hairs in the ♂, shining, less closely punctured and nearly glabrous in the ♀, first and second segments in the ♂, with a short lateral line of brownish pubescence at the apex, the remainder with entire narrow apical bands, first second, and third in the ♀ with a lateral band of white hairs, fourth with an entire band, ♂ with the sixth segment angulated at the sides, seventh deeply foveated, its apex pointed, second ventral segment with a very large vertical transverse tubercle, third, fourth and fifth emarginate and fringed with golden hairs, armature with the stipites rather wide, parallel at the base, convergent and almost meeting at the apex, sagittæ distant at the base, widened and touching each other at the apex, ♀ with the ventral scopa greyish white; legs clothed with pale hairs, calcaria pale.

L. 8-9 mm.

Rare. Woking; Chobham; Charlwood, Surrey; Hastings. Charlton, Kent; Hawley, Hants; Weybridge; (*Smith*). Exeter; (*Parfitt*). Leigh Woods, Bristol; Coddenham, Suffolk; (*Kirby*). Gloucestershire; (*Perkins*). Maidstone; (*Frisby*). Sidmouth; (*R. C. L. Perkins*).

This pretty little species generally makes its cells in bramble stems, but last spring (May, 1893), I found it rather freely, burrowing along the side of a sandy road on Woking Common.

Quite distinct from *parvula* Duf. and Perr., with which the continental authors confuse it.

O. spinulosa, Kirby.—Black, head and thorax clothed with pale brown hairs, soon fading to grey, very closely and finely punctured in the ♂, the mesonotum in the ♀ largely punctured, antennæ in the ♂ not quite reaching to the tegulæ; wings smoky, nervures dark, scutellum sharply dentate at the sides, propodeal area slightly shining; abdomen largely and closely punctured, rather shining, sparingly clothed on the disc, and more densely at the sides, with very short pale hairs, each segment with a short lateral streak of pale hairs at the apex, fourth and fifth in the ♂ with an entire band, sixth denticulate along the apical margin, seventh terminating in a sharp point, first ventral segment with a strong erect central spine, second sometimes with a narrow short sub-apical spine, third visible only at the sides, fourth and fifth entire; sagittæ of the armature narrow, with the apices convergent and pointed, nearly meeting, ♀, apex of abdomen simple, ventral scopa orange red; legs clothed with pale hairs, calcaria pale.

L. 7-8 mm.

Common in some localities; Reigate; Hastings; Deal. Luccombe Chine, Isle of Wight; Croydon; (*Smith*). Portland; (*Enock*) Lulworth; (*Dale*). Colchester; (*Harwood*). Dover and Charing, Kent; (*Marshall*). Sidmouth; (*R. O. L. Perkins*). Norfolk; (*Bridgman*). Gloucester; (*Perkins*). Bury St. Edmunds; (*Tuck*).

STELIS, Panz.

Closely allied to the following genus, *Anthidium*, although in the British species no similarity would suggest itself between them. On the Continent, species of each genus occur which are even hard to separate specifically. The number of joints of the maxillary palpi vary from two to three, the labial palpi are four-jointed, wings with two sub-marginal cells, abdomen with the apex simple in the ♂, five ventral segments exposed, sixth rounded at the apex, seventh very

narrow and fragile, eighth broad and subquadrate, with a slight apical projection, armature with the stipites suddenly thickened at the apex, forming a sort of four-sided truncate club; ♀ without any observable pollen brush. The British species of this genus are parasitic on *Osmia*, but some of the foreign species associate with *Anthidium* and other genera. The genus is of very limited extent. Smith says it occurs in Siberia, India, North China, and United States. We have three species in this country which are easily distinguished.

- | | | |
|-----|---|---------------|
| (4) | 1. Abdomen unspotted. | |
| (3) | 2. Posterior margins of the segments pale . | ATERRIMA. |
| (2) | 3. Posterior margins of the segments not | |
| | pale | PHLEOPTERA. |
| (1) | 4. Abdomen spotted at the sides | OCTOMACULATA. |

S. aterrima, *Panz. (punctulatissima, Kirb.)*.—Black, head and thorax dull, closely and deeply punctured, clothed sparingly with greyish hairs, tegulæ black, wings dusky, marginal cell brown anteriorly, scutellum with an angular tooth on each side of its base; abdomen slightly shining, sparsely clothed with very short greyish hairs, very largely and deeply punctured, posterior margins of the first four segments pale testaceous, sixth segment in the ♂ rounded at the apex, seventh only visible ventrally, four ventral segments visible, the second, third and fourth with their apical margin fringed with long golden hairs, the two latter concave and densely pubescent, fifth and sixth excavated and clothed with golden hairs, eighth produced at the apex into two little round processes, armature with the stipites each terminating in a four-sided club, sagittæ short and slightly pointed, ♀ with the six ventral segments exposed, shining, largely punctured and sparsely clothed with golden brown hairs.

L. 8–9 mm.

The least rare species of the genus but far from common.

Hastings; Southwold; Herne Bay. Deal; Weybridge; Blackwater, Hants; Birchwood, Kent; Ilfracombe; Sidmouth; Clifton, near Bristol; (*Smith*). Bury St. Edmunds; (*Tuck*). Land's End; (*Marquand*). Bewdley; (*Marshall*). Colchester; (*Harwood*). Peterborough; Blandford; (*Dale*). Maidstone; (*Frisby*). Norfolk; (*Bridgman*). Occurs from June to August associating with *Osmia fulviventris*.

S. phæoptera, *Kirb.*—Very like *aterrima* but rather more shining, the scutellum without distinct lateral teeth at the base, and the segments of the abdomen without pale apical bands. Genital armature very small, shaped much as in *aterrima*.

L. 8-9 mm.

Rare; associates with *O. fulviventris*. Battersea; Hammersmith; Fulham; (*Smith*). Exeter; (*Parfitt*). Addiscombe; (*Rothney*). Sidmouth; Chippenham; (*R. C. L. Perkins*). Glanvilles Wootton; Dorchester; (*Dale*). Land's End; (*Marquand*). Allington, near Maidstone; (*Frisby*). Bury St. Edmunds; (*Tuck*).

S. octo-maculata, *Smith.*—Smaller than either of the preceding and less coarsely punctured, and at once distinguished by the yellow spots of the abdomen, of which there are two oval ones on the basal and second segment, and a transverse spot on each side of the third and fourth, those of the fourth in the ♂ being divided into two, in this sex there is also a single spot on the fifth; scutellum slightly produced, subangular, pointed in the middle.

L. 6-7 mm.

Very rare. Associates with *Osmia leucomelana*. Hawley, near Blackwater, Hants; Sidmouth; (*Smith*). Exeter; (*Parfitt*).

ANTHIDIUM, Fab.

Of this extensive genus, which is found in both the old

and new world, there is only one British representative, which is very unlike any other of our bees. The ♂ is as a rule much larger than the ♀, the maxillary palpi in the British species are two-jointed, the labial palpi four-jointed, the second joint slightly shorter than the first, the maxillæ are pointed, somewhat resembling those of *Celioxys*, the scales at their base well developed; the labrum is elongate, its sides slightly rounded; wings with two submarginal cells, scutellum produced over the meta-notum, abdomen with yellow spots, ♂ with the seventh dorsal segment more or less spinose, six ventral segments exposed, clothed with long hairs, eighth with a narrow apical process, armature with the stipites short and curved; ♀ with a ventral scopa composed of simple hairs. Smith says that *A. manicatum* has never been known to make a burrow of its own, but employs those made by other insects, which it lines with the woolly coating of the stems and leaves of certain plants which it scrapes off with its mandibles, rolls up into a ball and carries off to the nest; the cells are enclosed in a semi-transparent membrane.

A. manicatum, *Linn.*.—Black, head and thorax closely punctured, clothed with short yellowish-brown hairs above, with nearly white hairs beneath; mandibles except at the apex, a bilobate spot on the clypeus, the cheeks below the antennæ, and a small spot behind each eye yellow; thorax with the tegulæ yellow in front, wings slightly dusky; abdomen black, clothed with erect greyish brown hairs, and with a band of denser, browner hairs at the apex of each segment, the lateral margins of the segments in the ♂ with fringes of curved golden hairs, each of the first four segments with a yellow spot on each side, larger in the ♂ than in the ♀, the fourth has usually also two other discal spots between the lateral ones, the fifth has two or four spots in the ♂, and two elongate transverse spots in the ♀, the sixth in both sexes bears two discal spots, which are transverse in the ♂, the sixth and seventh segments in

the ♂ are armed with an apical spine on each side, and the seventh also with a narrow central spine, segments beneath clothed with grey hairs, third slightly produced in the centre, ♀ with a dense golden scopa; legs more or less variegated with yellow, densely clothed with long somewhat silvery, shining hairs, intermediate and posterior metatarsi in the ♂ longer than the tibiæ.

L. 11-16 mm.

Abundant in some localities, but chiefly in the Southern parts of England, it has occurred in Scotland where it is very rare, but has not been recorded from Ireland. It appears about the end of June, and is particularly partial to *Lamium purpureum*. It is very variable in the extent of the yellow coloration.

EUCERA, Scop.

♂ and ♀ very dissimilar; labial palpi four-jointed, the first and second joints very wide, the second not half so long as the first, third and fourth divergent, very small, short and cylindrical, paraglossæ exceedingly long, filiform towards the apex, longer than the labial palpi, maxillæ with a slight hook at the apex, their palpi six-jointed, labrum transverse, antennæ in the ♂ nearly as long as the entire insect; thorax densely hairy, wings with two submarginal cells; six ventral segments exposed in the ♂, armature stout, the stipites produced into very narrow bent processes; ♀ with the posterior metatarsi dilated, produced at the apex outwardly almost to the apex of the second joint, polliniferous hairs on the tibiæ and metatarsi.

Of this genus there is only one British species, although the number of European species is considerable; it often forms large colonies, burrowing in the ground. Smith says "their burrows are usually about six inches in length; at the end of each an oval chamber is excavated; it is

perfectly smooth within and coated or lined with a liquid secretion by the parent bee which prevents the mixture of pollen and honey deposited in a semifluid state from being absorbed.

E. longicornis, *Linn.*.—Black, head and thorax punctured, densely clothed with fulvous brown hairs, paler beneath, clypeus and labrum in the ♂ yellowish white, and the antennæ very long, nearly reaching to the apex of the body, each joint of the flagellum slightly curved, those of the ♀ short, only reaching to the tegulæ; wings slightly clouded; abdomen closely and rugosely punctured, convex in the ♂, less convex and wider in the ♀, ♂ with the first and second segments clothed with long fulvous hairs, the rest with short brownish black hairs, ♀ with the first and second clothed with dull brownish hairs, the rest with black, each segment with a lateral band of paler hairs at the apex, those of the fourth segment nearly meeting in the centre, band of the fifth entire and golden, beneath clothed in both sexes with pale hairs, the apical segments of the ♀ with golden, ♂ with a black somewhat quadrate tubercle on each side of the seventh segment at the apex, eighth shining, its apex subtruncate, with a narrow central emargination, armature with each stipes produced into a very narrow subfiliform process, bent inwards near the apex, sagittæ wide and triangular; legs clothed with pale hairs, calcaria pale.

L. 15-16 mm.

Local, but abundant in many places, and widely distributed, it appears in May; *Nomada sexfasciata* occurs with it as an inquiline.

MELECTA, Latr.

I have altered the position of this genus because the structure of the mouth parts, and the general form of the ♂ armature, certainly ally it with *Anthophora*, with which

genus it associates; the present position therefore seems to be its natural one; labial palpi four-jointed, the second joint not half so long as the first, paraglossæ each produced at the apex into a long filiform process, not quite so long as the labial palpi, maxillæ very long and narrow, subparallel sided, their palpi five-jointed; an unusual character exists in this genus, at the side of each upper sclerite of the hypopharynx near the base, the investing membrane is chitinized into a dark plate, and at the base of the maxillæ on the membrane are two long, dark, chitinous plates which, I believe, represent the basal scales; the labrum is trapeziform, narrower in front, wings with three submarginal cells, scutellum bidentate, abdomen usually with white pubescent spots, rather pointed, six ventral segments exposed in the ♂, seventh composed of two elongate, convergent, almost separate plates, which unite at the apex, eighth subtriangular, armature stout, cardo short; ♀ without polliniferous organs. A genus of inquiline bees, which have all a great general similarity and associate with *Anthophora*; it is of small extent, most of its species being palæarctic, but Smith in 1876 says that four occur in Chili. We have only two in this country.

1. Pubescence of head and thorax ashy grey, lateral spots of the third and fourth abdominal segments large and quadrate LUCTUOSA.
2. Pubescence of head and thorax brownish or greenish grey, spots of the third and fourth segments small and punctiform ARMATA.

M. luctuosa, Scop.—Black, head and thorax rugosely punctured, vertex clothed with greyish white hairs, intermixed with black, face just above the antennæ clothed with greyish white hairs in both sexes, below the antennæ in the ♂ with white hairs bordered at the sides with black, in the ♀ with black, with only a patch of snow-white hairs at the base of the clypeus; antennæ with the basal joint densely clothed with long white hairs in the ♂, with shorter black ones, intermixed with white, in the ♀; thorax

clothed with greyish white hairs in front of the insertion of the forewings, with black hairs behind, and with a tuft of white hairs just behind the insertion of the hind wings, scutellum with a spine on each side, mesopleuræ with a patch of white hairs; wings smoky, the centres of some of the cells darker; abdomen shining, very finely punctured, first segment clothed with white hairs at the base, the white hairs in the ♂ extending almost to the apex, in the ♀ there is an apical patch of white hairs on each side, the remaining segments clothed with very short black hairs, second, third, and fourth segments in both sexes and fifth also in the ♂ with a lateral transverse spot of white pubescence at the apex, seventh in the ♂ deeply emarginate; beneath clothed with short black hairs, sclerites of the seventh in the ♂, sinuate on their inner margins near the apex, which is truncate, eighth subtriangular narrowly truncate at the apex, with two rather strong apical setæ, stipites of the armature with the sides slightly convex; legs clothed with black hairs, a spot on each tibia at the base, the intermediate femora beneath, and the intermediate and posterior tarsi in front in the ♂, with white hairs, posterior metatarsi straight.

L. 13 mm.

Not common, associates with *Anthophora retusa*. Chobham. Hampstead Heath; (Smith). Colchester; (Harwood). Gloucestershire; (Perkins). These are the only localities I have received, but it is probably often confused with the next species which is far less rare.

M. armata, Panz. (*punctata*, Kirb., Curt.).—Very like *luctuosa* but differing in the following particulars, the pale pubescence of the head and thorax is of a browner tint, the face is entirely clothed with ochreous hairs, abdomen rather more coarsely punctured, the second segment with its sides clothed with long pale hairs like those of the first, third and fourth in both sexes and the fifth in the ♂, with small punctiform lateral spots, seventh in the ♂ less deeply

emarginate, seventh ventral segment with the inner margins of its sclerites straight as they approach the apex, which is rounded; eighth with two small hairy tubercles at the apex, stipites of the armature, with the sides subparallel, slightly concave; legs in the ♂ with the tibiæ clothed externally with pale ochreous hairs, except at the extreme apex; in the ♀ at the base only, tarsi in both sexes more or less clothed with white hairs above, the posterior metatarsi distinctly concave along their upper margin.

L. 13 mm.

Associates with *Anthophora pilipes* and not uncommon round the burrows of that species.

The round spots of the abdomen vary much in size and are sometimes entirely absent.

ANTHOPHORA, Latr.

This is a very extensive genus and distributed all over the world, the species in the ♂ sex present very strong structural characteristics, in the ♀ they are more uniform; they rather resemble small humble-bees in general form, although very distinct from them in minute structure; the labial palpi are four-jointed, the second joint not more than a quarter so long as the first, the third and fourth very small, and cylindrical, paraglossæ sheath-like, the basal portion of each ensheathing the base of the tongue anteriorly, the lateral portion produced into a long concave process which ensheaths the tongue posteriorly and laterally, tongue exceedingly long, maxillary palpi six-jointed, basal scales of the maxillæ well developed, oval, and fringed with bristles, labrum transverse, antennæ of the ♂ and ♀ subequal in length, clypeus and labrum in the ♂ of the British species white; wings with three submarginal cells; ♂ with six ventral segments exposed, seventh with long divergent

branches at its base, its apex produced into a variably shaped plate, eighth short, subtruncate at the apex, armature stout, variable in form, the sagittæ wide and triangular, deeply excavated near the base of their inner margin; intermediate legs of the ♂ much modified in some of the species, posterior metatarsi of the ♀ outwardly dilated and produced almost to the apex of the second tarsal joint, truncate apically and fringed with hairs, posterior tibiæ with a dense pollinigerous scopa. The four British species may be distinguished thus:—

- | | | | |
|-----|----|---|-----------------|
| (4) | 1. | Basal joint of intermediate tarsi in the ♂ with a dense pencil of black hairs; hairs of the ♀ entirely black except on the scopa. | |
| (3) | 2. | All the joints of the intermediate tarsi in the ♂ with very long hairs, ♀ with the calcaria black | PILIPES. |
| (2) | 3. | ♂, intermediate tarsi not longly ciliated, ♀ calcaria pale | RETUSA. |
| (1) | 4. | Basal joint of intermediate tarsi in the ♂ simple; ♀, hairs not entirely black. | |
| (6) | 5. | Abdomen without distinct transverse pale bands | FURCATA. |
| (5) | 6. | Abdomen with distinct transverse pale bands | QUADRIMACULATA. |

A. retusa, Linn. (*Haworthana*, Kîrb.).—Head and thorax black, clothed in the ♂ with bright fulvous hairs, in the ♀ with black, face in the ♂ with paler hairs, centre of the mesonotum with black, labrum, sides of the face, scape of the antennæ in front and clypeus white in the ♂, the last of these narrowly black at the apex and broadly at the base, ♀ with the two mandibular teeth subequal and rounded; thorax rather closely punctured, wings slightly dusky; abdomen black exceedingly finely and closely punctured, ♂ with the basal segment and sometimes also the second clothed with long fulvous hairs like those of the thorax, the rest with black, sometimes the second segment is clothed with black hairs and has only an apical band of fulvous, the other segments also have sometimes slightly paler apical bands, abdomen in the ♀ entirely clothed

with rather short, black hairs, seventh segment in the ♂ with a narrow central glabrous region which is truncate at the apex; abdomen clothed with black hairs beneath in both sexes, seventh ventral segment in the ♂, with the apical area transverse and truncate, eighth bidentate in the centre of its apical margin, each tooth with long apical hairs, armature with its sides subparallel, stipites dilated triangularly at the apex, and emitting a very narrow filiform process, pointed inwards towards the sagittæ; legs clothed with pale fulvous hairs in the ♂, those of the posterior tibiæ inwardly, and of the posterior and intermediate metatarsi, black, those of the latter very long, dense and projecting, posterior tibiæ with a patella, hairs of the legs in the ♀ black those of the scopæ bright orange, calcaria in both sexes and apical joints of the tarsi in the ♂ pale.

L. 15-16 mm.

Not nearly so common as the following. Woking; Chobham; Hastings; Worthing. Colchester; (*Harwood*). Maidstone; (*Frisby*). Norfolk; (*Bridgman*). Burrows in the ground in banks, &c., and appears in April and May, it makes its cells of clay.

A. pilipes, *Fab.* (*retusa*, *Kirb.*; *acervorum*, *Smith*).—Very like the preceding, but differing in the following points:—

♂, pubescence longer and generally of a less rich brown, fading to a greenish grey, clypeus nearly entirely pale, alar hooks of posterior wings twenty to twenty-two instead of only fifteen to sixteen, intermediate tarsi with the first and fifth joints densely clothed with projecting black hairs, the first to the fourth also fringed with extremely long grey hairs, calcaria black, seventh ventral segment more rounded apically, eighth much wider, carinated down the centre, armature not parallel sided, stipites with two apical processes, from the inner of which is emitted a filiform process, wider and longer than that of *retusa*.

♀ differs from *retusa* in having the pubescence shorter, the face less transverse, the mandibles with the apical tooth long and sharp, the calcaria of the posterior tibiæ black, and the puncturation of the abdomen less dense and fine.

L. 15-16 mm.

Common and generally distributed, one of the earliest spring bees, burrows in the ground like the preceding. A little *Chalcid*, *Melittobia*, West=*Anthophorabia*, Newport, frequents the burrows of this species. An interesting account of it is given by Mr. Newport, who considered it as a parasite of the bee, in "Linnean Transactions," vol. xxi. p. 63; F. Smith found this little parasite in the cells of the *Anthophora*, but with it another parasite, *Monodontomerus nitidus*, and the conclusion he came to was that the *Monodontomerus* was the true parasite of *Anthophora* and *Melittobia* of *Monodontomerus*, but he says that *Melittobia* attacked indiscriminately the larvæ of both, although "in their natural situation I only found them feeding on *Monodontomerus*."

A. furcata, *Panz.*—Black, head and thorax closely punctured, clothed with brownish hairs, those of the vertex of the former, and of the discal band on the latter black; ♂ with the clypeus except its apical margin, labrum, anterior lateral angles of the face, a transverse spot above the clypeus, and a line on the scape of the antennæ, flavous; wings slightly smoky; abdomen somewhat shining, finely punctured, the first three segments clothed with very pale brownish hairs, those of the second and third, especially in the ♂, intermixed with darker ones, remaining segments in the ♂ clothed with black hairs, fourth in the ♀ clothed with black hairs, fifth and sixth with bright golden red hairs, the latter with a narrow glabrous dorsal area, ♂ with the seventh segment bidentate, fourth and fifth ventral segments of the ♂ clothed with fine velvety golden pubescence, sixth deeply emarginate, seventh with the

apical plate raised posteriorly and truncate, eighth flat, truncate, with a slight central emargination, armature with the stipites truncate at the apex, with a short narrow process at their inner angle; ventral segments of the ♀ fringed with fulvous hairs, legs simple in both sexes, clothed with pale brownish hairs, the hairs on the side towards the body darker, apical joint of the tarsi in the ♂ testaceous.

L. 11–12 mm.

Not very common, burrows in dead wood, and appears in July. Chobham; Southwold; Deal; Littlehampton; Hastings. Norwich; (*Bridgman*). Bury St. Edmunds; (*Tuck*). Rugby, Lowestoft; (*Morice*). Colchester; (*Harwood*). London District; (*Smith*). Devon, generally distributed; (*Parfitt*). Glanvilles Wootton; Sandown, Isle of Wight; (*Dale*). Tavistock; (*Swale*). Gloucestershire; (*Perkins*). Maidstone; (*Frisby*). Mr. Bridgman remarks that the larvæ of this species, which are enclosed in cells of triturated wood, spin cocoons just before changing, which is not the case with the two preceding.

A. quadrimaculata, *Panz.* (*vulpina*, *Kirb.*; *subglobosa*, *Kirb.*).—Slightly smaller than the preceding, black, head and thorax punctured, clothed with pale ochreous hairs, intermixed with black on the vertex and thorax, clypeus and labrum in the ♂ white, the former with two irregularly shaped spots on the disc, the latter with two spots on its basal margin, black, anterior margin of both clypeus and labrum narrowly black, sides of the face, a transverse spot above the clypeus, and the scape of the antennæ in front also white, face and antennæ in the ♀ entirely black; mesonotum in the ♂ shining, and sparsely punctured on the disc, dull in the ♀, wings scarcely clouded, scutellum in the ♂ shining, and almost impunctate in the ♂; abdomen rather shining in the ♂, dull in the ♀, clothed in both sexes with dark hairs, each segment with an apical band of pale hairs, basal segment entirely clothed with long

pale hairs, seventh segment in the ♂ emarginate, sixth in the ♀ with an arrow dorsal area, raised in its centre; ventral segments fringed with long pale hairs in both sexes, sixth in the ♂ somewhat membranous at the apex, with a central apical slit, seventh with its apical plate somewhat five sided, the apex truncate, eighth narrowed towards the apex, and slightly emarginate, armature of the ♂ with the stipites much narrowed towards the apex, emitting an angular tooth outwardly, and terminating in two narrow processes, legs simple in both sexes, clothed with pale hairs which are nearly white outwardly, intermediate femora of the ♂ dilated.

L. 10-11 mm.

I have only met with this species at Blackheath, but Smith says it is not uncommon in the London district, frequenting the Dead Nettle, *Lamium purpureum*, and making its burrows in banks, sandy cliffs, etc. Parley Heath; Bournemouth; Dawlish; (*Dale*). Exmouth; (*Parfitt*). Gloucestershire; (*Perkins*).

SAROPODA, Latr.

It seems to me very doubtful whether this should be retained as a distinct genus from *Anthophora*, it is only distinguishable by the four-jointed maxillary palpi, and the absence of the cylindrical divergent joints of the labial palpi, which so far as I can see are only two-jointed. There is only one British species.

S. bimaculata, *Panz.* (*rotundata*, *Kirb.*).—Black, head and thorax closely punctured, clothed with bright fulvous hairs in the ♂, with sooty-brown hairs in the ♀; those of the underside in both sexes, and of the face in the ♀ paler, entire face below the antennæ in the ♂, a central line at the base of the clypeus, a wide band at its apex and the labrum in the ♀, whitish, mandibles also white except at the apex in both sexes, scape of the antennæ in the ♂ white in front, eyes in life of a bright opalescent green,

wings nearly clear; abdomen short and subrotundate, its basal segment clothed with long pale hairs, the rest with shorter erect black ones, each with a narrow apical band of adpressed pale hairs, except the fifth in the ♀, which has a dense fringe of dark brown hairs, seventh segment in the ♂ with a central carina, which branches at the apex and forms two teeth, sixth in the ♀ with a narrow dorsal area densely fringed at its side with dark brown hairs, ventral segments fringed with long pale hairs in both sexes, apical plate of the seventh segment in the form of a transverse parallelogram, eighth truncate at the apex, its centre slightly emarginate, armature with the stipites slightly angulated on their lateral margin with a narrow subfiliform apical process; legs clothed with very pale glittering hairs on their outer side, with darker hairs on the side towards the body, posterior metatarsi as long as the tibiæ, which in the ♀ have a distinct patella.

L. 9-10 mm.

Abundant in some localities, appearing in July, and burrowing in the ground, often forming extensive colonies. Chobham; Woking; Bournemouth; Hayling Island; Coombe Wood; Weybridge; Blackwater, Hants; Sidmouth; Budleigh Salterton; Sandown, Isle of Wight; (Smith). Exmouth; (Parfitt). Hastings; (Bennett). Bishops Teignton (Marshall). Saunton Cliffs, N. Devon; (Swale).

PSITHYRUS, Lep.

(*Apathus*, Newm.)

The insects that compose this genus associate with the true humble bees, or *Bombi*, which they closely resemble; they live in the same nests with them, but it is not known in what way, if in any, they contribute to the

comfort of the community. From the observations of different writers it would appear that the various species do not always keep to the same host; carefully noted observations on this point are, however, much wanted. The following associations, I think, are probably right: *P. rupestris* with *B. lapidarius*; *P. vestalis* with *B. terrestris*; *P. Barbutellus* with *B. hortorum*; *P. quadricolor* (*Barbutellus*, Sm.) with *B. pratorum* and *Jonellus*; *P. campestris* (according to most authorities) with *B. muscorum* and *venustus*, but according to Smith with *hortorum* and *Latreillellus*.

Psithyrus resembles *Bombus* in habits of life; the females pass the winter in an impregnated state, and lay their eggs in the spring in the cells of the *Bombus*. Mr. F. W. L. Sladen informs me that the ♀ *Psithyrus* on entering the nest of a *Bombus*, at least in the cases of *B. terrestris* and *lapidarius*, fights the ♀ belonging to the nest and kills her, and then makes little waxen cells for her own eggs on some prominent portion of the comb; the first hatched out are males, and both sexes leave the nest as soon as they are fully matured. Structurally the genus is almost identical with *Bombus*, but the posterior tibiae are devoid of any polliniferous arrangement of hairs. Labial palpi four-jointed, maxillary palpi two-jointed; wings usually darker than in *Bombus*, with three submarginal cells; abdomen as a rule less densely hairy, and in the ♀ incurved at the apex, the apical ventral segment more or less callose on its posterior margin; posterior tibiae in both sexes convex, dull, and hairy, the posterior metatarsi in the ♀ without a basal spine on the outer margin; in this respect the ♀ differs very widely from that of *Bombus*, but in the ♂ the difference is less marked; still, in this sex, the face of *Psithyrus* is always much shorter and rounder, and the external margin of the tibia is always fringed with short hairs, whereas in *Bombus* the hairs of the fringe are very long; the surface of the tibiae also is always duller in *Psithyrus*. The distribution

of the genus is similar to that of *Bombus*. There are five British species which may be distinguished thus :—

- | | | | |
|-----|----|--|--------------|
| (2) | 1. | Fourth and following segments of the abdomen clothed with red hairs in both sexes | RUPESTRIS. |
| (1) | 2. | Fourth and following segments not all clothed with red hairs. | |
| (4) | 3. | ♂ with the abdomen subglobose, its extreme apex clothed with fulvous hairs; ♀ with the extreme apex of the sixth ventral segment armed with a pointed process | QUADRICOLOR. |
| (3) | 4. | ♂ with the abdomen subtriangular, its extreme apex clothed with black hairs; ♀ with the apex of the sixth segment simple. | |
| (6) | 5. | Posterior metatarsi in both sexes as wide as the tibiæ, the apical white hairs of the abdomen usually separated from the basal black ones by a line of yellow; ♂ sagittæ not toothed beneath; scutellar hairs in the ♀ black | VESTALIS. |
| (5) | 6. | Posterior metatarsi narrower than the tibiæ; no line of yellow pubescence between the black and white; ♂ sagittæ toothed beneath; scutellar hairs of the ♀, except in black variety of <i>campestris</i> , yellow. | |
| (8) | 7. | Hairs of the apical segments of the abdomen black or yellow; ♂ with the sixth ventral segment simple, with a pencil of long black hairs on each side; ♀, sixth dorsal segment shining at the base | CAMPESTRIS. |
| (7) | 8. | Hairs of the apical segments white, sixth ventral segment in the ♂ with a distinct apical callosity on each side; ♀ with the sixth dorsal segment rugosely punctured | BARBUTELLUS. |

P. rupestris, *Fab. (Albinellus, Kirby. ♂)*.—Black, clothed with black hairs, those of the fourth and following segments of the abdomen red in both sexes, those of the thorax and basal segments of the abdomen often, and those at the sides of the second and third rarely, more or less greyish in the ♂; wings very slightly smoky in the ♂, dark blackish-brown with blueish reflections in the ♀; antennæ in

the ♂ with the third and fifth joints subequal, the fourth a little more than half the length of the fifth; abdomen closely punctured in both sexes; sixth segment in the ♀ dull, very closely punctured and clothed with exceedingly short red pubescence, beneath punctured, lacinia of ♂ armature with its inner margin widely emarginate and produced basally into a sharp angle, sagittæ hamate beneath near the centre and slightly so at the apex, sixth ventral segment in the ♀ with its posterior margin reflexed, the reflexion angularly produced on each side; tibiæ and tarsi in the ♂ clothed with red hairs, in the ♀ with black, those at the apex of the metatarsi and the other tarsal joints in this sex alone reddish.

L. 16-22 mm.

Associates with *Bombus lapidarius*, and like that species widely distributed throughout the kingdom, though far less common than its host.

P. vestalis, *Fourc.*—Black; head and thorax densely clothed with black hairs, a broad band in front of the latter in both sexes, and a few hairs on the vertex of the former in the ♂, yellow, antennæ with the fourth joint in the ♂ shorter than the third, fifth almost as long as the third and fourth together; wings smoky in both sexes; abdomen punctured, the posterior margins of the segments shining and smooth in the ♂, the first and second segments clothed with black hairs, the first in the ♂ often with yellow hairs intermixed, or sometimes entirely yellow, third with black hairs at the base, with lemon-yellow at the apex, the fourth and fifth with white, sixth in the ♂ with white and black intermixed, seventh with black, sixth in the ♀ shining, narrowly grooved towards the apex, which, as well as the sides, is clothed with short velvety fulvous pubescence, segments beneath largely punctured, sixth simple in the ♂, not tuberculate, lacinia of the armature shortly triangular, sagittæ not hamate in the centre beneath, but with their apices angularly dilated laterally, sixth segment in the ♀ with a longitudinal callosity on each side, subparallel

to the margin, the callosities not nearly meeting at the apex; apex between them densely clothed with fulvous velvety pubescence; legs clothed with black hairs, apical joints of the tarsi piceous, with reddish hairs, the hairs on the sides of the tibiæ and tarsi towards the body in the ♀, fulvous; posterior metatarsi in both sexes as broad as the tibiæ.

L. 18-22 mm.

Associates with *B. terrestris*, and is generally distributed.

P. Barbutellus, *Kirb. nec Smith.*—Very like *vestalis*, but easily distinguished by the following characters: in both sexes the hairs of the vertex of the head and of the scutellum are more or less yellow; in the ♂ the third joint of the antennæ is much longer than the fourth, and the fifth is only slightly longer than the third; the basal segment of the abdomen in both sexes more or less clothed with yellowish hairs, the third segment with no lemon-yellow band between the black and the white, sixth in the ♀ rugosely punctured, with a raised central line, sixth ventral segment in the ♂ with a slight tubercle on each side near the apex, sixth in the ♀ with its posterior margins rounded, and callosely raised on each side, the callosities meeting at the apex, which is clothed with velvety hairs only beyond them, lacinia of ♂ armature subelongate, sagittæ strongly hamate in the centre beneath; posterior metatarsi in both sexes distinctly narrower than the tibiæ.

L. 17-20 mm.

Generally distributed, associating with *B. hortorum*.

P. campestris, *Panz. (Rossiellus, Kirb.; Franciscanus, Kirb.; Leeanus, Kirb.; subterraneus, Kirb.)*.—A most variable species in colour, especially in the ♂, which is sometimes entirely clothed with black hairs and sometimes almost entirely with yellowish hairs, but so far as I know the hairs of the apical segments are never white as in the two preceding species; as a rule the coloration is not unlike that of *Barbutellus*, with the apical segments yellowish. The ♀ has nearly always the head and thorax coloured as in

Barbutellus, the apex of the abdomen being clothed with yellow hairs, more or less widely interrupted down the centre; a quite black variety, however, sometimes occurs. The following structural characters will distinguish the species in all its varieties:—

♂ with the fourth joint of the antennæ very slightly shorter than the third, fifth about two-thirds as long as the third and fourth together; sixth ventral segment slightly channelled down the middle, without apical tubercles, each side bearing a tuft of long black hairs, armature with the sagittæ strongly hamate beneath, the lacinia very broad and triangular, their inner margins straight, meeting each other in parallel lines.

♀ with the sixth ventral segment narrowly rounded at the apex, its posterior margins with very wide callosities which nearly meet apically, leaving a long apical sulcature between them.

L. 17–20 mm.

Generally distributed, associating, according to most authors, with *B. muscorum*, but according to Smith with *hortorum* and *Latreillellus*. The general coloration and variability of the species would rather suggest the association given by Smith; possibly, however, it associates with both.

P. quadricolor, *Lep. (Barbutellus, Smith)*.—Coloured much as the preceding, but differing in the following particulars:—

♂ with the third and fifth joints of the antennæ subequal, fourth about two-thirds as long as the fifth; abdomen shorter, less pointed, apical half of the third segment and the whole of the fourth clothed with white hairs, fifth with black, sixth and seventh or rarely the seventh only, with rufescent hairs; seventh ventral segment simple, lacinia of the armature very long and narrow, many times longer than wide.

♀ Smaller than any of the preceding, abdomen looked at from above more rounded, apex clothed with white hairs,

the sixth dorsal segment shining, finely and irregularly punctured, sixth ventral segment armed at the apex with a shining, reflexed triangular spine or tooth which projects amongst the dense pubescence which clothes the apex, lateral callosities feeble and not produced nearly to the apex.

L. 15-20 mm.

Generally distributed, associating with *B. pratorum* and *Jonellus*.

BOMBUS, Latr.

Robust, body densely clothed with long hairs; tongue very long, labial palpi four-jointed, the first and second joints very wide and sheath-like, the third and fourth divergent, very short and cylindrical; paraglossæ with their dorsal plates narrowly rounded at the apex, lateral sheaths nearly twice as long as the dorsal plates, maxillæ pointed, slightly hooked at the apex, their palpi two-jointed, the scales at the base of the maxillæ small, bearing several long hairs, labrum transverse; wings with three submarginal cells; six ventral segments of the abdomen exposed in the ♂, seventh corneous, subtransparent, eighth narrow, somewhat truncate, hairy at the apex; tibiæ in the ♂ somewhat shining, with a more or less distinct impression down the centre; in the ♀ dilated and concave, the concavity very shining and fringed on each side with long hairs; this arrangement, which is called the "corbicula," is used for the conveyance of the pollen which is more or less moistened and compacted; posterior metatarsi in the ♀ and ♂ produced at the base outwardly into a spine-like process.

The species of this genus are social, living in more or less extensive communities, the females differ externally from the workers only in size; some of the species make their nests in the ground, others on the surface, and those of the latter section have been called by some authors

"Carder Bees." Mr. F. W. L. Sladen, of Ripple Court, near Dover, has lately paid a good deal of attention to the habits of the British *Bombi*, and in the remarks which follow I have drawn largely from information very kindly furnished by him. The ♀ *Bombus*, as is well known, hibernates in an impregnated state, waking up in the first warm days of early spring, to set to work and found a new colony. She commences by searching up and down hedge-banks, etc., to find a suitable locality, either on or in the ground, where she may form her cells; according to Mr. Sladen's observations, this is usually a deserted mouse-nest, or occasionally a bird's-nest, and he doubts if any of the *Bombi* lay the original foundation of a nest, but believes that they always appropriate some other. Having settled on her habitation, she brings into it the pollen which she collects; this she lays in a heap, and in this heap she lays her eggs, in some cases (and Mr. Sladen is inclined to think generally) in a cell excavated for the purpose, which after oviposition is sealed up with wax. By degrees the larvæ emerge from the eggs, and feed on the heap of pollen, which the parent bee keeps replenishing for their use, and under which they remain hidden; she also forms a waxen cell in which she deposits the honey she has brought home in her honey sac. When the larvæ are fully grown they spin themselves cocoons, often of a bright yellow colour, from which emerge worker bees; these, as soon as they are matured, assist the ♀ in the collection of honey and pollen, and in the general economy of the nest. The ♀ goes on laying eggs, and, according to Mr. Sladen, soon remains at home altogether, leaving further out-of-door labour to the workers. The old cocoons from which the workers have emerged are now used as receptacles for honey, and by some species also for storing pollen, the pollen storers making waxen cells in some numbers for the reception of honey, apparently for immediate use, what is stored one day being generally con-

sumed by the next morning; more workers continually hatch out, and after a time the new males and females begin to emerge. The last eggs laid by the ♀ produce males; the older workers also lay eggs as the season advances, which always develop into males.

The number of individuals in a colony varies much, the colonies of the underground builders being the most numerous on the average in this respect. Smith says that the communities of *terrestris* are the largest; a nest of this species taken in August contained 35 ♀, 20 ♂, and 160 ♀, the majority of males and females had probably left the nest; in another nest he found 107 ♂, 560 ♀, and 180 ♀. The nests of the surface builders, according to the same authority, contain only about half as many individuals. The behaviour of the bees on their nests being disturbed varies according to the species: *terrestris*, typical form, and *lapidarius*, especially the former, resent the intrusion vigorously, flying round the heads of their disturbers, and doing their best to sting them; *muscorum*, *sylvarum*, etc., on the other hand, appear to be terrified, and simply lie on their backs, trying to sting anything which comes near them. The species of *Psithyrus*, as stated under the heading of that genus, occur in the nests asinquilines, and species of the *Dipterous* genera, *Volucella* and *Conops*, are parasitic on *Bombus*. *Mutilla europæa* occurs also in some nests, but very little is known of its parasitic habits; various *Coleoptera* also are found, which come probably for the food obtainable from the wax and honey. A species of *Acarus* also infests the nests, feeding on the wax, and sometimes swarming on the bodies of the bees and amongst the eggs.

The species of *Bombus* are exceedingly difficult to distinguish apart, the colour of the pubescence varies so greatly in different specimens of some species that it is wise to rely only on structure as a character in the discrimination of the species; these characters are often very obscure, and

difficult to appreciate. There are several species which, as a rule, are quite easy to recognize, but of which rare varieties occur quite unlike the typical form. The most reliable character is the form of the ♂ genital armature; this will always guide one rightly, but in the absence of the ♂ it is sometimes impossible to say for certain what a ♀ or ♀ is. The structural characters in these latter are to be looked for in the shape of the face, and especially the length of the cheeks and of the tongue, and the form of the intermediate and posterior metatarsi.

The genus *Bombus* is very widely distributed, but is commonest in temperate regions; according to Smith it is absent in Central and South Africa, Madagascar, Australia, and New Zealand, but lately it has been introduced into the two last-named colonies. Fifteen species occur in our islands, which may be tabulated thus:—

- | | | | |
|-----|----|--|-------------|
| (6) | 1. | Thorax clothed with yellow or brownish-yellow hairs without indication of a darker transverse band. | |
| (5) | 2. | Pubescence of the abdomen above in both sexes entirely pale, shorter, and more regular, second segment with a basal band of more orange-brown coloured hairs; this colour is partly due to the hairs being more erect, and therefore seen at a different angle; ♂ with the antennal joints scarcely rounded beneath, and sagittæ of armature hamate at the apex. | |
| (4) | 3. | ♂, third joint of the antennæ considerably longer than the fourth; pubescence of underside usually black in both sexes, but if pale, then with the tibiæ clothed with black hairs | SMITHIANUS. |
| (3) | 4. | ♂, third and fourth joints of the antennæ subequal, pubescence of underside and tibiæ pale in both sexes | |
| (2) | 5. | Pubescence of abdomen usually with black hairs intermixed, longer, uneven, and somewhat ragged, all the | VENUSTUS. |

- hairs subdecumbent; ♂ with the antennal joints each considerably produced and rounded on their lower margin, sagittæ of armature not hamate at the apex
- (1) 6. Thorax clothed with black hairs or more or less banded with black. AGROURUM.
- (18) 7. ♂ with the posterior metatarsi fringed with very short, straight, bristly hairs, or with the cheeks three-quarters as long as the eyes; ♀ with the intermediate metatarsi spinosely produced at the external apical angle, or with the face across the eyes wider than long.
- (13) 8. Apex of abdomen clothed with black, yellow, brownish, or white hairs, but not with red.
- (12) 9. Face across the eyes longer than wide.
- (11) 10. ♂, sagittæ of armature serrate beneath, posterior metatarsi clothed with somewhat long hairs; ♀ and ♀, face exceedingly elongate, tongue reaching when fully extended to the apex of the abdomen HORTORUM.
- (10) 11. ♂, sagittæ not serrate beneath, posterior metatarsi clothed with very short hairs; ♀ and ♀, face not so elongate, tongue not reaching to the apex of the abdomen LATREILLELLUS.
- (9) 12. Face across the eyes wider than long. TERRESTRIS.
- (8) 13. Apex of abdomen clothed with red hairs.
- (15) 14. ♂, face clothed with pale hairs; ♀ and ♀ with the first and second abdominal segments clothed with pale hairs, the third with black, the apex with red SYLVARUM.
- (14) 15. ♂, face clothed with black hairs; ♀ and ♀, abdomen clothed with black hairs at the base, or if with pale, then with no black on the third segment.
- (17) 16. Hairs of posterior tibiæ red or pale DERHAMELLUS.
- (16) 17. Hairs of posterior tibiæ black POMORUM.
- (7) 18. ♂, posterior metatarsi fringed with long hairs, cheeks not three-quarters as long as the eyes; ♀, intermediate metatarsi not spinosely produced at the exterior apical angle, face longer than wide across the eyes.

- (20) 19. Abdomen with the third and following segments clothed with red hairs in both sexes LAPPONICUS.
- (19) 20. Abdomen with the apex white, or with only the fourth and following segments clothed with red hairs.
- (24) 21. Apex of abdomen clothed with white, or sometimes rosy white, not red hairs.
- (23) 22. ♂, posterior metatarsi with the upper and lower margins subparallel, except at the extreme base; ♀ and ♀, first segment of the abdomen clothed with pale hairs at the base JONELLUS.
- (22) 23. ♂, posterior metatarsi much constricted towards the base, the upper margin curved; ♀ and ♀, first segment of abdomen clothed with black hairs at the base SOBROENSIS.
- (21) 24. Apex of abdomen clothed with red hairs.
- (26) 25. ♂, with the basal segments of the abdomen almost entirely clothed with black hairs, sagittæ of armature sharply and angularly hamate at the apex on their inner edge; ♀ and ♀, thorax entirely clothed with black hairs or rarely with a very narrow pale prothoracic band LAPIDARIUS.
- (25) 26. ♂, basal segments of abdomen clothed with pale hairs, sagittæ with their apices turned inwards in the form of a sickle-shaped hook; ♀ and ♀, thorax with a broad band of pale hairs in front.
- (28) 27. ♂, fifth joint of the antennæ much longer than the fourth, and about three-quarters as long as the third and fourth together, lacinia of armature elongate, parallel-sided, obliquely truncate at the apex; ♀ and ♀, face broader, especially across the base of the mandibles, abdominal black band confined to the third segment CULLUMANUS.
- (27) 28. ♂, fifth joint of antennæ scarcely longer than the fourth, lacinia of armature short and transverse; ♀ and ♀, face narrower, especially across the base of the mandibles, black band of the abdomen not confined to the third segment PRATORUM.

B. Smithianus, *White (arcticus, Dahlb. nec Kirb.)*.—Head clothed with black hairs, face in the ♂ with a little pale pubescence below the antennæ, cheeks about as long as their apical width, antennæ in the ♂ with the joints slightly rounded in front, the third considerably longer than the fourth; thorax clothed above with bright fulvous hairs, which are of a richer, darker colour than those of any of our other species, at the sides and beneath with black or rarely with pale; wings smoky brown; abdomen clothed with lemon-yellow hairs of a much duller colour than those on the thorax, those at its base rather darker and browner, apical segment in both sexes clothed with black hairs, beneath clothed with black or rarely with pale hairs, the intermediate segments in the ♂, especially at the sides, with pale, armature in the ♂ with the inner margin of the lacinia semicircularly emarginate, with a sharp spine-like tooth at the base of the emargination, between the teeth densely fringed with hairs beneath, between the basal tooth and the apex of the stipes is a flat, somewhat triangular tooth-like process, sharply pointed at its apical angle, sagittæ hamate beneath at the apex, and angulated beneath before the middle.

L. 15-20 mm.

Shetland; Orkney, (*Morice*); and Hebrides. Single examples have also been recorded from Dover and Scilly.

I cannot think that Schmiedeknecht is right in referring this species to *alpinus*, Linn., of the ♂ of which he says "*tibiæ posticæ . . . cum tarsis longe fulvo pilosæ*." In *Smithianus* they are clothed with short black hairs—by the form of the ♂ armature it more closely resembles the species called *cognatus* by the Continental authors, but the figure in Schmiedeknecht's "*Apidæ Europæ*," and that in Hoffer's "*Hummeln Steiermarks*," both represent the lacinia as so much longer than it is in our species that I doubt if they can be identical. The Rev. F. D. Morice took this species abundantly in Shetland last September

(1894), and a variety, in Orkney (the only form he saw), with pale underside, but even in this variety all the tibiæ are clothed with black hairs, otherwise the ♀ closely resembles that of *venustus*.

B. *venustus*, Smith (*cognatus*, Saund. nec Steph., *variabilis*, Schmied., *muscorum*, Kirb., *senilis*, Smith).—This species may be known from the preceding by the pale hairs of the underside and from the following, which it much resembles in some varieties: by its shorter and more even pubescence, and by the darker, somewhat brown hairs of the second abdominal segment, but this darkness is partly, I think, due to the pubescence being more erect than it is in *agrorum*, and therefore seen at a different angle; it also differs from most of the varieties of *agrorum* in having no black hairs mixed with the pale ones of the abdomen; pale varieties, however, of *agrorum* occur without black hairs and dark varieties of *venustus*; in the latter case the pubescence of the thorax is partly composed of black hairs, but that of the abdomen, although sometimes, according to Schmiedeknecht, dark brown, is not composed of black and pale hairs intermixed as in *agrorum*. The only reliable structural characters that I know of, are the shorter, less ragged, pubescence of all the sexes of *venustus*, the much less produced and rounded posterior margins of the antennal joints in the ♂, their greatest width scarcely equalling half their length, and the form of the armature in which the sagittæ are hamate beneath at the apex and not serrate externally, and the wider and more triangular lacinia, whose basal process is produced into an angular point, not into a spine as in *agrorum*.

L. 10–18 mm.

Common in many places and generally distributed. There is no doubt that this is *variabilis*, Schmied., but Smith's name has the priority. I have re-examined the type of *cognatus*, Steph., which is in the British Museum. The specimen is very immature, the pubescence being exceedingly pale, and the legs testaceous, the nature

of the pubescence is uneven and ragged like that of *agrorum*, of which I believe it to be an immature example. F. Smith placed it in the British Museum collection under *muscorum* "immature." It certainly is not the species known on the Continent as *cognatus*.

B. agrorum, *Fab.* (*muscorum*, *Smith*, *Saund.*, *cognatus Steph.*, *floralis*, *Kirb.*, *Beckwithellus*, *Kirb.*, *Francillonellus*, *Kirb.*, *Forsterellus*, *Kirb.*, *Sowerbianus*, *Kirb.*, *Curtisellus*, *Kirb.*, *agrorum*, *Kirb.*, *agrorum*, *Smith*).—Head clothed with pale yellowish hairs intermixed with black, the proportions that these differently coloured hairs bear to each other varying greatly, face elongate, cheeks slightly longer than their apical width, antennæ in the ♂ with the joints much rounded posteriorly, their greatest width considerably more than half their length; thorax densely clothed above with bright tawny yellow hairs, intermixed on the disk, in some dark varieties with black, sides and beneath with pale yellowish hairs; abdomen clothed with tawny yellow hairs mixed or unmixed with black hairs, nearly every variation from yellow to black may be met with, the black hairs sometimes forming transverse bands, sometimes only lateral spots, beneath clothed with pale hairs, sixth ventral segment in the ♂ with a slight transverse apical callosity, apex of the sixth ventral segment in the ♀ with a distinct longitudinal carina. ♂ armature with the lacinia terminating in a sharp, somewhat falcate spine-like process, and bearing another sharp projecting spine near its union with the stipes, and a third spine on its ventral margin which is almost hidden by the wide plate of the lacinia, sagittæ not hamate at the apex; legs clothed with black and pale hairs intermixed.

L. 10–18 mm.

Common and generally distributed, a surface builder. I have followed the Continental authors in adopting the name *agrorum* for this species, as it does not seem certain what species was described by Linnæus under the name

muscorum. Smith, Ent. Ann., 1870, records a curious case of this species invading a wren's nest, heaping up her bee bread, etc., amongst the eggs of the bird, till the parent bird was forced to desert the nest. Mr. Sladen found a mouse nest in an old shoe occupied by a colony of this species in full work.

B. hortorum, Linn. (*subterraneus*, Auct. nec Thoms, *Harrisellus*, Kirb., *Tunstallanus*, pars, Kirb.).—Head clothed with black hairs, face very long and parallel-sided, the cheeks shining, more than half the length of the eyes, antennæ in the ♂ with the third and fifth antennal joints subequal, the fourth very short, tongue in both sexes very long, when fully extended almost as long as the entire insect, but rather shorter in *vars. subterraneus* and *Harrisellus*; thorax clothed entirely with black hairs or with an anterior and posterior band of yellow ones; wings rather smoky; abdomen either clothed entirely (*var. Harrisellus*) with black hairs, or (typical *hortorum*) with yellow hairs on the first segment and base of the second, black on the second and third, and white on the fourth and fifth, black on the sixth. Between these extreme varieties almost every variety occurs; in the ♀ of what used to be called *subterraneus*, the hairs are rather shorter and the colouring is intermediate between typical *hortorum* and *Harrisellus*, the yellow being of a browner tint, and the abdomen, like that of *Harrisellus*, less pointed at the apex, and more bulky than in typical *hortorum*; segments beneath clothed with pale or sooty hairs, armature of the ♂ with the sagittæ narrow, finely and sharply serrate beneath, lacinia elongate, narrow, and apiculate towards the apex, considerably produced at its base along the inner margin of the stipes, and strongly emarginate, its base recurved and terminating in a spine, the emargination densely fringed with hairs; legs clothed with black hairs in the ♀ and ♂, with reddish and black hairs in the ♂; metatarsi in the ♂ fringed with very short hairs.

L. 12-22 mm.

Very common and generally distributed, intermediate varieties of the ♂ are rare, but they are very common in ♀ and ♀. It is an underground builder, and forms large communities.

B. Latreillellus, Kirb. (*subterraneus*, Thoms., *Tunstallanus*, Kirb. *pars, elegans*, Smith, *fragrans*, Kirb., *distinguendus*, Mor.).—Rather like *hortorum* in some of its varieties, but easily distinguished by the shorter face, and shorter, more even pubescence. Head clothed with black, or in *var. distinguendus* with pale yellowish hairs intermixed with a few black ones, those of the vertex of the ♂ in all the varieties pale, cheeks not half so long as the eye, tongue considerably shorter than in *hortorum*; thorax clothed with black hairs, anteriorly and posteriorly banded with pale yellowish, or (*var. distinguendus*) with yellow hairs, with a wide black band between the wings, wings slightly smoky; abdomen clothed with short, even, close fitting pubescence, black on the first and second segments and the base of the third, dingy white on the apex of the third and on the fourth and fifth, black on the sixth, or in *var. distinguendus* entirely clothed, with the exception of the apical segment, with yellow hairs, the hairs at the base of the first and second segments of rather a darker shade; in the black varieties the basal segments have often paler transverse bands; in the ♂ the colour of the pubescence of the abdomen varies from almost entirely black to entirely pale yellow, running through every intermediate variation of transverse banding, beneath clothed with pale or dark hairs according to the varieties, apical segment of the ♂ with a tuft of long hairs on each side, armature with the sagittæ truncate, and produced laterally at the apex into a transverse subquadrate process, and also dentate laterally near the middle, the tooth somewhat trifid, the lacinia of the stipites very short, truncate apically, with a small, curved tooth at the inner angle of the truncature; between

this and the apex of the stipes the lacinia is produced inwardly into a transverse process; legs clothed with black or pale hairs, metatarsi of the ♂ with very short hairs.

L. 15–20 mm.

Generally distributed and not rare, though probably often overlooked. The *var. distinguendus* is rare, but has occurred at Mount Edgecumbe, near Plymouth; (*Bignell*). Hampstead; Shirley; Norwood; Lowestoft; Yorkshire; (*Smith*). Norfolk; (*Bridgman*). Rugby; (*Morice*). Gloucestershire; (*Perkins*). Lancashire; (*Gardner*). Perth; (*McGregor*). Dumfries; (*Service*). N. Uist.; Isle of Man; (*Dale*).

Mr. Sladen says that the cocoons of this species are often blotched with masses of wax, and the nests have a characteristic disagreeable odour.

B. sylvarum, *Linn.*.—Head and thorax clothed with greyish hairs, more or less intermixed with black, especially on the vertex and across the mesonotum, where the black hairs form a distinct band, those of the sides of the thorax and of the propodeum entirely pale. Fifth joint of the antennæ in the ♂ as long as the two preceding together, cheeks in both sexes about as long as their apical width; abdomen in both sexes clothed with greyish hairs, those at the base of the second segment tinged with orange, and those at its sides black, third segment clothed with black hairs, but with a grey apical band, remaining segments clothed with orange coloured hairs, each with an apical band of grey, beneath and legs clothed with grey hairs, the anterior and intermediate tibiæ with black, intermediate metatarsi in the ♀ and ♂ produced at the outer apex into a distinct spine, armature of the ♂ with the sagittæ hamate at the apex, the lacinia terminating in a sharp point, and produced below it on its inner margin into a short truncate process, on a lower level to which is a second rounded hairy process; nearer the base than these, just at its union with the stipes, is emitted a long sharp spine-like process; the inferior margin of the lacinia is densely fringed with hairs.

L. 12-14 mm.

This species is common and generally distributed; it is a surface builder. In this country it varies but little, and is therefore easily recognized, but on the Continent there exists a variety named *nigrescens* by Professor Perez, which can scarcely be distinguished from *Derhamellus*. The ♂ might be confounded with *pomorum*, but its shorter face, the black band on the third abdominal segment, and the utterly dissimilar armature, will distinguish it at once.

B. Derhamellus, Kirb. (*Raiellus*, Kirb.).—Hardly distinguishable from the preceding in form, although the ♂ may be known by the fifth joint of the antennæ not being quite so long as the third and fourth together, and by the short truncate process of the lacinia being much narrower, and the long basal and spine-like one shorter and blunter and more directed forwards; the inferior margin of the lacinia also is less hairy. In the colour of the pubescence both sexes are widely different from *sylvarum* as it occurs in this country.

♂ head clothed with black hairs, sometimes intermixed with pale ones on the face, thorax entirely clothed with black hairs or with a wide band of pale hairs in front and behind; abdomen with the first, second, and base of the third segment clothed with black hairs, the rest with red, or with the first and second segments clothed with pale hairs, the base of the third with black, and the rest with red, or with the basal segment clothed with black, and all the others with red hairs; between these varieties many intermediate ones occur; legs with red hairs.

♀ and ♂ very little subject to variation; head and thorax clothed with black hairs, abdomen with black on the first, second, and third segments, and with bright red on the rest, in rare cases the red extends nearly to the base of the abdomen. I have two workers of this variety which at first sight I thought might be referable to *pomorum*, but the

form of the face shows that they belong to this species ; tibiae with red hairs.

L. 12-18 mm.

Common and generally distributed.

The ♀ closely resembles that of *lapidarius* in colour, but its short abdomen and red-haired tibiae will easily distinguish it.

B. pomorum, *Panz.*—Head clothed with black hairs, face very long, the cheeks much longer than their apical width, third joint of the antennae in the ♂ about once and a half as long as the fourth, fourth about half as long as the fifth ; thorax clothed with black hairs, which anteriorly and posteriorly are subject to be replaced by pale ones ; in some of the Continental varieties there is only a band of black hairs between the wings, those of the rest of the thorax being pale grey ; in typical *pomorum*, which is the only form that has occurred in Britain, the hairs of thorax in the ♂ are grey with a black interalar band, and those in the ♀ are black ; abdomen in the ♂ clothed with grey hairs on the basal segment, and with red on the rest, the apical fringes being slightly paler, in the ♀ and ♂ the hairs are black on the first segment and then gradually shade off into red, the whole of the apical segments being clothed with hairs of the latter colour, but in some Continental varieties the abdominal hairs are grey, underside clothed with red or pale hairs ; armature of the ♂ with the sagittae dentate in the centre of their inferior margin, curved downwards at the apex, which is dilated, obliquely truncate, and hamate beneath, lacinia elongate, bent almost at right angles at the apex, which bears a small slightly reflexed tooth, at the base of the lacinia is a transverse lamina, and between this and the apical process an obliquely projecting tooth ; legs clothed with black hairs, intermixed with reddish or grey ones.

L. 12-18 mm.

Exceedingly rare in this country, where the ♂ and ♀

only have occurred; of the former Mr. F. Smith caught three in 1837, his son caught one ♀ in 1864 near Deal. Smith in the second edition of his "British Bees" says, "I took three males in 1863," but in recording his son's capture of the ♀ in the Ent. Annual for 1865, p. 95, he says, "In the year 1837 I captured three humble bees, &c., &c." So I take the latter as the correct date.

B. lapidarius, *Linn.*.—Rather more elongate than most of the species of the genus, clothed with deep black hairs, those of the fourth and following segments of the abdomen bright red; ♂ with the face, a band across the thorax in front, sides of the thorax below the wings, and a few hairs round the propodeum posteriorly, yellow; abdomen beneath clothed with pale hairs at the base with red at the apex; in the ♀ the thorax has in very rare cases a pale band in front, cheeks about as long as their apical width; antennæ in the ♂ with the third and fifth joints subequal, the fourth about two-thirds as long as the third; armature with the sagittæ simple beneath, their apices each with a sharp hama on the inner side, lacinia emarginate at the apex, and subparallel-sided, lobate at the base; femora in the ♂ clothed with pale hairs beneath, tibiæ and metatarsi fringed with long red hairs; hairs of the legs in the ♀ black, intermediate metatarsi not produced at the apex.

L. 12-20 mm.

Common and generally distributed. The Rev. F. D. Morice has captured two curious examples of the ♀ in both of which the red of the apex of the abdomen "shades off" into the black of the base something after the manner of *pomorum*, but the greater width of the abdomen, and the absence of the produced angle of the intermediate metatarsi, will distinguish it easily. The cocoons of this species are of a peculiarly bright yellow, very clean and free from wax.

B. Jonellus, *Kirb.* (*Scrimshiranus*, *Kirb.*, var. *nivalis*, *Smith nec Dahlb.*).—In coloration almost similar to typical

hortorum but smaller, and easily recognizable by the following characters.

♂, face and vertex posteriorly clothed with yellow hairs, antennæ shorter, fourth joint more than half as long as the third, face short, the cheeks not one-third so long as the eyes, head and thorax beneath clothed with pale hairs; armature with the sagittæ not serrated beneath, each terminating in a sickle-like hook, lacinia very short, simple and subtruncate at the apex; femora beneath clothed with pale hairs, posterior metatarsi fringed with rather longer hairs.

♀ and ♂ much smaller than *hortorum*, the yellow colour less bright, the face much shorter, the cheeks not being more than a third the length of the eyes, the tongue not reaching beyond the basal segment of the abdomen, and the hairs of the posterior tibiæ usually red instead of black. A variety occurs in the Shetland Isles which F. Smith described as *nivalis*, in which the hairs of the first and second abdominal segments are entirely yellow, and those of the apical segments yellowish, not white; the hairs of the tibiæ in this variety are quite black. For a long time the identity of this form has remained doubtful, but recently Mr. Waterhouse was good enough to extract the armature from one of the ♂ specimens in the British Museum, and an examination of this organ proved the species at once to be identical with *Jonellus*. The Rev. F. D. Morice has lately taken both sexes freely in Shetland, and there can, I feel sure, be no doubt of their being only varieties of this species: in one small ♂ taken by him, the hairs of the abdomen are entirely pale.

L. 10-18 mm.

Local; Chobham; Woking; Bournemouth; Hayling Island; Coombe Wood; Purley Downs; Shirley; Barmouth, North Wales; Perthshire; (*Smith*). Rugby; Lowestoft; (*Morice*). Lulworth; (*Dale*). Plymouth; Bickleigh; (*Bignell*). Prawle Point; (*Parfitt*). Norfolk; (*Bridgman*). Gloucestershire; (*Perkins*). Lerwick, Shetland Isles.

B. lapponicus, *Fabr.*—Structurally almost identical with *pratorum*, but with the face wider; in the colour of the pubescence, however, it differs very considerably, the hairs of the vertex in both sexes, and of the face in the ♂, are more or less yellow, there is a wide yellow band on the thorax in front, and a narrow one posteriorly; the base of the abdomen is clothed with black hairs which in some examples only cover the basal segment, in others also the base of the second, all the other segments are clothed with red; femora and underside densely clothed with pale hairs in the ♂, tibiæ with reddish hairs; in the ♀ the hairs of the legs are black, except those of the tarsi, which are reddish.

L. 12–18 mm.

Mountainous districts; Black Mountain, Brecknockshire; Snowdon, and other Welsh Mountains; Herefordshire; Monmouthshire; Halifax Moor, Yorkshire; Loch Rannoch, Perth; (*Smith*). Cannock Chase; (*Morice*). Clwyd Hill, abundant in August; High Moors, Marston; (*Gardner*). Staleybridge; (*B. Cooke*). Chat Moss; (*Hardy*). Keighley, Yorks; (*Tyser*). Argyleshire; (*Swinton*). Aberdeenshire; (*Dale*). Gloucestershire; ♀ (*Perkins*).

I have little doubt that *Jonellus*, *pratorum*, and *lapponicus* are races of one species, but as they are easily distinguished by the colour of their pubescence, I have not thought it desirable to unite them; the armature in the ♂ is so far as I can see identical in all three.

B. pratorum, *Linn.* (*subinterruptus*, *Kirb.*; *Burrellanus*, *Kirb.*).—Head and thorax clothed with black hairs, the face and vertex in the ♂, and a broad band across the front of the thorax in both sexes yellow, the rest entirely black; face in the ♀ and ♂ decidedly narrower than in *Jonellus*, very slightly narrower in the ♂, but with the cheeks distinctly longer, and the fourth joint of the antennæ slightly longer in proportion to the third; abdomen in the ♂ clothed with yellow hairs on the first and second

segments, those of the extreme base of the first sometimes black, with black hairs on the third and often also on the fourth, and with red on the rest; the coloration of the ♀ and ♂ is somewhat similar, but the yellow of the hairs is less bright, the basal segment is generally clothed with black hairs, the second with yellow, and the third and fourth with black, and the apex with red. The black colour, however, is very apt to spread, and the yellow sometimes is entirely absent, and the red hairs of the terminal segments confined to the extreme apex; armature of the ♂ as in *Jonellus*; legs clothed with black hairs more or less reddish towards their apices; metatarsi of the ♂ as in *Jonellus*.

L. 10-18 mm.

Common and generally distributed, it is very partial to the flowers of the bramble.

B. Cullumanus, Kirby (*soroensis*, pars, Saund. *Synopsis*).—This species, which has been considered as a form of *soroensis* by Schmiedeknecht, Hoffer, and other Continental authors, has been recognized as distinct by Smith, Thomson, and Handlirsch; and the last author in his "Hummelstudien" (Ann. K. K. Naturh. Hofmuseums, vi., 1891) gives an excellent figure of the male armature. In my synopsis I treated it as a variety of *soroensis*, being misled by the similarity in its colouring to the var. *proteus* of that species. Mr. Waterhouse, however, was good enough to set the matter at rest by extracting the armature of Kirby's type, which at once revealed it as a distinct species.

♂ in form somewhat like *lapidarius*, face clothed with pale hairs, vertex with black, cheeks short, as wide as long, antennæ with the fifth joint much longer than the fourth, three-fourths as long as the third and fourth together, basal joints of the flagellum very slightly arcuate; thorax clothed with pale hairs with a broad interalar black band; abdomen with the first and second segments clothed with pale short greyish-yellow hairs, the third with black, the remainder with red, beneath clothed with pale hairs; arma-

ture with the sagittæ formed much as in *pratorum*, their apices being incurved in a sickle-like form, the lacinia is produced and parallel-sided, its apex obliquely truncate, the squama is somewhat square, its inner apical angle dentately produced; legs clothed with pale hairs, posterior metatarsi with rather short fine hairs, not constricted at the base as in *soroensis*.

♀ very like that sex of *pratorum*, but with the face shorter and squarer, the outer margin of the cheeks between the eyes and mandibles more parallel, and the black abdominal band narrower, confined to the third segment. I have not seen a worker.

L. 14-15 mm.

Southend; Brighton Downs; Bristol; (*Smith*). Suffolk; (*Kirby*).

B. soroensis, *Fabr.*—This species is probably amongst the most variable of the genus in the colour of the pubescence, and great confusion has been caused by this variability; in some varieties the whole insect is clothed with black hairs except the apex of the abdomen, which is clothed with whitish, in others the thorax has a wide yellow band in front, the second segment of the abdomen, and sometimes also the first being yellow, the third black, the fourth and following segments white, or white with a narrow red line at the base between the white and the black, or red, but there is no record of this last variety having been taken in Britain; in the ♂ the apex of the abdomen is often clothed with nearly pink hairs, which gives it a most characteristic appearance. The following structural characters will distinguish it from its allies.

♂. This sex may be known at once by the very peculiar form of its posterior metatarsi, these are slender, straight on their lower margin, very narrow at the base and of the ordinary width at the apex, the upper margin curving gradually upwards to the apex; in the other species, except *terrestris*, which has the metatarsi broad and fringed with short hairs, the upper margin is subparallel with the lower one, and

then more or less suddenly slopes down to the base; the upper margin in this species is fringed with very long hairs; the armature also is quite characteristic; the lacinia is exceedingly long, curved, and emarginately truncate at the apex, the inner angle of the truncature produced into a curved tooth, the rest of the lacinia is in the form of a convex lobe; sagittæ dentate beneath, turned outwards at the apex, dilated and obliquely truncate.

♀ and ♂ may be known from *terrestris*, which they most resemble, by the longer face and cheeks, the latter being nearly as long as their apical width, by the less definite yellow abdominal band which generally extends on to the basal segment, which gives it a less straight appearance, and also by the less compressed apical ventral valve.

L. 10–17 mm.

Rare. Ilfracombe; Yarm, Yorkshire; (Rudd). Carlisle; (Heysham). Brighton Downs; (S. S. Saunders). Croydon; Ipswich; (Rothney). Rugby; (Morice). Hertfordshire; (Piffard).

B. terrestris, Linn. (*lucorum*, Smith, *virginalis*, Kirby).

—Head clothed with black hairs, or in var. *lucorum* ♂ on the face with yellow, face short, the cheeks shorter than their apical width; antennæ of the ♂ shorter than in most of the species, scarcely reaching to the tegulæ, third and fifth joints subequal, fourth a little more than half as long as the fifth; thorax clothed with black hairs, a band in front, and often in the ♂ also one behind, yellow; in some varieties of the ♂ of var. *lucorum* the yellow hairs almost cover the whole thorax, leaving only a narrow black band between the wings; hairs of the abdomen variable in colour, black on the basal segment, yellow on the second, black on the third and fourth, and white or tawny on the apex of the fourth and the remaining segments, or with the first to the fourth segments yellow-haired in the ♂, the base of the third and fourth with a narrow black band; between these extremes various varieties occur, the colour of the yellow is also variable, in var. *lucorum* it is nearly

of a lemon tint, in var. *virginalis* it is brownish (in this latter form the hairs of the apical segments are tawny, in *lucorum* white), armature of the ♂ with the sagittæ slightly divergent at the apex, very deep, and much flattened laterally, their apices laterally bidentate; stipites with the lacinia short and transverse with a sharp angular tooth on the basal side of the transverse process; legs with black hairs, or in the pale vars. of *lucorum*, with pale, posterior metatarsi in the ♂ wide, gradually narrowed towards the base, fringed with rather short uneven hairs, other joints of the tarsi piceous.

L. 12-22 mm.

Very common, and generally distributed.

APIS, Linn.

Social; communities consisting of males, one female, and workers. Subelongate, clothed with short pale brownish hairs; labial palpi four-jointed, maxillary palpi one-jointed, eyes hairy, very large and approximate on the vertex in the ♂; anterior wings with three submarginal cells, the marginal cell very elongate and reaching nearly to the apex of the wing; abdomen subcylindrical, truncate at the base, anal aperture in the ♂ inferior, armature quite unlike that of any other genus (see *Introduction*, p. 13); second to fifth ventral plates in the ♀ with a sub-membranous and transparent area on each side at the base, covered by the apical portion of the preceding segment, through this membranous portion the wax exudes and lies in flat flakes on the surface until required for use; posterior tibiæ without calcaria, in the ♂ outwardly subconvex, in the ♀ subconvex and very pubescent, in the ♀ concave, shining, fringed laterally with long hairs, forming a corbicula as in *Bombus*; posterior metatarsi very large, their widest part in the ♂ broader than the apex of the tibiæ, their base in the ♀ produced outwardly into a lateral tooth. On the habits of the honey bee volumes have been written, and they are so well known

that very little need be said here. A new community is started by the queen of an old nest or hive leaving it when the new brood becomes too numerous for it to be able to accommodate the whole community, and taking with her or being followed by a large number of the workers. These select a suitable place to form a new nest, or are collected by a bee keeper into a new hive, where the workers make new comb, and in which a new family is reared. In many respects the habits of *Apis* resemble those of *Bombus*, but the beautifully formed hexagonal waxen cells in which the honey is stored is a great advance on the rough honey receptacles of *Bombus*; but *Apis*, of course, requires food for the community through the winter, whereas the communities of *Bombus* only exist during the summer months. According to Smith (*Cat. Brit. Hymenopt.*, 2nd edit. 1876), there are nine species of *Apis*; five occur in India and the Eastern Archipelago, one in China, one in Africa, one in Madagascar and Rodriguez, and one in Europe, N. Africa, etc. Of this last there are several varieties, the best known one being the *Ligurian* bee; this may be known from ordinary *mellifica* in having the basal segments of the abdomen more or less extensively testaceous.

A. mellifica, *Linn.*.—Brown, clothed with pale brown hairs; eyes in the ♂ occupying the entire side of the head, and meeting on the vertex, in the ♀ and ♂ remote on the vertex and not nearly touching the base of the mandibles; pubescence of the thorax very dense and short in the ♂, longer and more sparing in the ♀ and ♂; wings nearly hyaline; abdomen pubescent, the pubescence shorter in the ♂, very blunt at the apex in this sex, very elongate and pointed in the ♀; segments in all the sexes more or less testaceous or piceous at the apex, and in the ♂ and ♀ with bands of slightly paler pubescence at the base; legs clothed with pale brownish hairs.

L. 13–17 mm.

Common, but rarely, if ever, found wild in this country.

SUPPLEMENT.

SINCE the pages containing the *Andrenidæ* were published, the following three additional species have been described as British, two by Mr. R. C. L. Perkins, and one by myself, in the *Entomologists' Monthly Magazine*, vol. xxxi. pp. 39 and 258.

Sphecodes rubicundus, *v. Hag.*—"♂ head and thorax closely punctured, and rather densely clothed with grey hairs, much as in *pilifrons*; antennæ rather short, the joints much swollen in front, with very narrow basal pubescent rings, fourth joint hardly longer than the second and third together, and subequal to the fourth, the following joints almost as wide as long; abdomen suboval, unusually wide for that of a ♂, and formed more like that of *ferruginatus*, the basal and second segment entirely red, the third more or less black at the apex, basal segment largely and somewhat remotely punctured, the following segments more closely so, lacinia of the armature produced into a single spoon-shaped process, quite unlike that of any other British species; second submarginal cell almost as wide at the base as high, wing hooks five to seven. ♀ closely resembles that sex of *spinulosus* and *pilifrons* by the close puncturation and hairiness of the mesonotum, but may be known from the former by the coarser puncturation of the head, the shorter antennæ, the joints of the flagellum of which are wider than long, and by the smaller number of its alar hooks, 5-7 instead of 9-10; from the latter (*S. pilifrons*) it may be known by the red colour of the abdomen extending almost to the apex, the fifth segment

and sometimes the apex of the fourth alone being black, also by the stronger puncturation of the segments, and the slightly more pointed, smoother and less flattened area of the dorsal valve."

Ringwood, near Dover (*Sladen*); both sexes dug out of a bank with *Andrena nigroænea* and *labialis*, on one or both of which it is probably inquiline; a ♂ was captured at large in May, and a ♀ in June. Several more of both sexes in the imago state were dug up in August. I have a ♀ of what I believe to be this species from Littlehampton, and another from Tunbridge Wells. This is the only species of *Sphecodes* whose ♂ appears in the spring in this country.

In the table of *Sphecodes* antea, p. 196, division 15 should be subdivided thus:—

- | | | |
|------|---|---------------|
| 15a. | ♂, abdomen red at the extreme base; ♀, abdomen with the first four segments red or rarely with the extreme apex of the fourth black | . RUBICUNDUS. |
| 15b. | ♂, extreme base of abdomen black; ♀, with the fourth and following segments black. | |

Halictus angusticeps, *Perkins*.—"Almost identical in form and sculpture with *H. punctatissimus*, Schenck having the face similarly formed, much longer than wide. ♂, black, apex of clypeus, labrum and mandibles (except at extreme base and apex) yellow; flagellum pale beneath; tarsi testaceous, generally more or less obscure. Head and thorax and abdomen with grey pubescence; head above the antennæ closely and distinctly punctured, decidedly more largely than in *punctatissimus*, and the surface shining between the punctures; mesothorax also rather more largely punctured and more shining; abdomen distinctly and evenly punctured all over, even to its extreme base; genitalia with the dorsal surface of the stipites at their apex prolonged into a process bent downwards and clothed with short hairs; from their lower surface is given off a

reflexed expanded membrane convexo-concave and somewhat fan-shaped. A small portion of these membranes appears on either side of the stipites in a dorsal view of the armature."

HAB. Sidmouth, S. Devon; Weymouth.

Easily distinguished from *punctatissimus* by the darker tarsi and the peculiar form of the armature; ♀ unknown.

In the table of species of *Halictus antea*, p. 208, division 44 should be subdivided thus:—

44a.	tarsi pale testaceous	.	.	.	PUNCTATISSIMUS.
44b.	do. nearly black	.	.	.	ANGUSTICEPS.

Andrena ambigua, *Perk.*—"♂ face with pale hairs generally more or less mixed with black ones towards the sides, those on the clypeus nearly white; apex of labrum hardly emarginate, mandibles simple at the base; antennæ with the second and third joints of the flagellum subequal in length; thorax with brown hairs, paler at the sides and on the metathorax; basal segment of abdomen and the base of the second with long fulvous hairs, the rest with sparser decumbent pubescence; the segments punctured at the base, smooth and shining along their apical margins; legs with pale hairs; abdomen beneath with long suberect pubescence; the apical margins of the segments ciliated with pale hairs.

♀ face with black pubescence, labrum hardly emarginate, clypeus somewhat sparsely irregularly punctured, thorax as in the ♂, but more densely clothed; two basal segments with bright fulvous hairs, third and fourth with paler and more decumbent ones, apical segments with black hairs; dorsal valve of sixth segment very finely and closely punctured, depressed along the margins; scopa dark above."

HAB. Near Moreton-Hampstead; Dartmoor. ♂ and ♀ taken in *coitú*, King's Lynn, Norfolk (*Barrett*); Tostock, near Bury St. Edmunds (*Tuck*).

The simple mandibles of the male and the black-haired face of the ♀ separate this species from *helvola* and *fucata*; from *varians* the ♂ may be known by the longer third joint of the flagellum which in *varians* is much shorter than the second, and the ♀ by the less closely and regularly punctured clypeus, and the pale abdominal hairs.

In the table of species of *Andrena* antea, p. 231, division 36 should be thus subdivided:—

- | | | |
|------|--|----------|
| 36a. | ♂, third and fourth joints of flagellum sub-equal; ♀ clypeus irregularly punctured | AMBIGUA. |
| 36b. | ♂, third joint of flagellum much shorter than the second; ♀ clypeus more regularly punctured | VARIANS. |

ADDENDA ET CORRIGENDA.

P. 26, line 18, for *Reg.* read *Rog.*

P. 50, **Tiphia minuta**, *V. de L.*

The radial cell in the ♀ is open, and not closed as represented in my description and table. I must somehow have had a ♂ under my eye at the time of writing. The ♀ of *minuta* may be known from that of *femorata* by the black legs and the entire, not abbreviated, central carina of the propodeum, as well as by its small size.

P. 114, **Mellinus arvensis**, *Linn.*, and **sabulosus**, *Fab.*

In my descriptions I have mentioned the tubercles of the antennal joints in the ♂ of *sabulosus* only; they occur also in *arvensis*.

P. 138, line 8 from bottom, insert after "sexes," "the anterior pair in the ♂ strongly and triangularly produced externally."

P. 165, line 19, before "unspotted" insert "generally."

P. 166, line 6, do. do.

P. 204, line 9, delete "five" and insert "and."

P. 217, line 15, for "Hastings" read "Isle of Wight."

P. 218, line 11, for "segments" read "segment."

P. 253, **Andrena ferox**, *Smith*, ♂.

Mr. R. C. L. Perkins has pointed out to me that the spine in this male is situated on the apex of the cheek, and not at the base of the mandible, as described by me. It is, therefore, analogous to the spine in the *spinigera* form of *A. rosæ*, *Panz.*



INDEX.

	PAGE		PAGE		PAGE
ACUTILINGUES . . .	191	conversiuscula, Kirb.	238	proxima, Kirb.	265
Agenia, Schiötte . .	72	decorata, Smith . .	236	pubescens, Kirb. . .	250
bifasciata, Smith. .	73	denticulata, Kirb. .	251	rosæ, Panz.	237
hircana, Fab. . . .	73	digitalis, Kirb. . .	265	rustarsis, Kirb. . .	249
variegata, Linn. . .	73	dorsata, Kirb. . . .	265	Schrankella, Kirb.	255
Ammophila, Kirb. . .	86	erimia, Smith . . .	237	separa'a, Smith . .	263
affinis, Kirb. . . .	89	extricata, Smith . .	252	Shavella, Kirb. . .	259
campestris, Latr. . .	88	fasciata, Nyl. . . .	252	similis, Smith . . .	266
hirsuta, Scop. . . .	88	ferox, Smith	253	simillima, Smith . .	249
lutaria, Fab.	89	floreæ, Fab.	238	Smithella, Kirb. . .	245
sabulosa, Linn. . . .	87	fucata, Smith . . .	247	spinigera, Smith. .	237
viatica, Smith . . .	88	fulva, Schr.	241	thoracica, Fab. . .	239
Ancistrocerus, Wesm.	164	fulvago, Chr.	261	tibialis, Kirb. . . .	235
Andrena, Fab.	223	fulvicerus, Kirb. . .	252	tridentata, Kirb. .	249
affinis, Kirb.	253	fulvescens, Smith . .	262	Trimmerana, Kirb.	237
Afzeliella, Kirb. . .	268	fuscata, Kirb. . . .	268	varians, Rossi . . .	245
albicans, Kirb. . . .	231	fuscipes, Kirb. . . .	250	vitrea, Smith	236
albicerus, Kirb. . . .	256	Gwynana, Kirb. . . .	243	Wilkella, Kirb. . .	267
ambigua, Perk. . . .	383	hemorrhoidalis, Kirb.	254	Wilkella, Saund. . .	266
analis, Panz.	258	Hattorfiana, Fab. . .	254	zanthura, Kirb. . . .	267
angulosa, Thoms. . .	247	helvola, Linn. . . .	247	Anthidium, Fab. . .	341
angustior, Kirb. . . .	244	humilis, Imh.	262	manicatum	342
apicata, Smith	244	intermedia, Thoms. .	258	ANTHOPHILA	171
aprilina, Smith . . .	242	labialis, Kirb. . . .	263	Anthophora, Latr. .	347
argentata, Smith . .	257	lapponica, Smith . .	244	acerorum, Smith . .	349
armata, Kirb.	241	Lathamana, Kirb. . .	254	furcata, Panz. . . .	350
atriceps, Kirb.	235	Lewinella, Kirb. . . .	265	Haworthiana, Kirb.	348
austriaca, Panz. . . .	238	Listerella, Kirb. . . .	251	pilipes, Fab.	349
barbilabris, Kirb. . .	256	longipes, Smith . . .	254	quadrimaculata, Panz.	351
bicolor, Fab.	243	lucens, Imh.	260	retusa, Kirb.	348
bimaculata, Kirb. . .	236	melanocephala, Kirb.	239	retusa, Linn.	348
bucephala, Steph. . .	254	minutula, Kirb. . . .	263	sulglobosa, Kirb. . .	351
Cetii, Schr.	255	Mouffetella, Kirb. . .	235	vulpina, Kirb.	351
chrysosceles, Kirb. .	258	nana, Kirb.	264	Apathus, Newm. . . .	353
cineraria, Linn. . . .	240	nigriceps, Kirb. . . .	248	Apis, Linn.	379
cingulata, Fab. . . .	256	nigroænea, Kirb. . . .	242	melifica, Linn. . . .	380
Clarkella, Kirb. . . .	241	nitida, Fourc.	239	Aporus, Spin.	57
clypeata, Smith . . .	245	nudiusscula, Kirb. . .	265	Arpactus, Panz. . . .	104
Coitana, Kirb.	259	parvula, Kirb.	263	Asemotoptrum, Mayr.	34
Collinsonana, Kirb. .	265	picicornis, Kirb. . . .	237	Astatus, Latr.	77
combinata, Kirb. . . .	265	picipes, Kirb.	237	boops, Schr.	78
conjuncta, Smith . .	236	pilipes, Fab.	234	stigma, Panz.	79
connectens, Kirb. . .	265	polita, Smith	261		
consimilis, Smith . .	239	præcox, Scop.	245	Blephoripus, Lep. . .	138
constricta, Smith . .	261	prætexa, Smith . . .	236	Bombus, Latr.	359

	PAGE		PAGE		PAGE
<i>agrorum</i> , Fab. . .	367	<i>quadricincta</i> , Panz. . .	119	<i>Lindanius</i> , Shuck. . .	144
<i>arcticus</i> , Dahlb. . .	365	<i>quinqüefasciata</i> , Smith . . .	120	<i>litratus</i> , Panz. . .	145
<i>Beckwithellus</i> , Kirb. . .	367	<i>sabulosa</i> , Smith . . .	118, 119	<i>luteipalpis</i> , Shuck. . .	136
<i>Burrellanus</i> , Kirb. . .	375	<i>Ceropales</i> , Latr. . .	74	<i>obliquus</i> , Shuck. . .	136
<i>cognatus</i> , Saund. . .	366	<i>maculata</i> , Fab. . .	74	<i>pallidipalpis</i> , Shuck. . .	136
<i>cognatus</i> , Steph. . .	367	<i>variegatus</i> , Fab. . .	75	<i>palmarius</i> , Schreb. . .	133
<i>Cullumanus</i> , Kirb. . .	376	<i>Chelostoma</i> , Latr. . .	303	<i>palmpes</i> , Linn. . .	134
<i>Curtisellus</i> , Kirb. . .	367	<i>campinularum</i> , Kirb. . .	310	<i>patellatus</i> , Panz. . .	143
<i>Derhamellus</i> , Kirb. . .	371	<i>florisomne</i> , Linn. . .	309	<i>Panzeri</i> , V. d. L. . .	146
<i>distinguendus</i> , Mor. . .	369	<i>Cilissa</i> , Leach . . .	270	<i>peltarius</i> , Schreb. . .	143
<i>elegans</i> , Smith . . .	369	<i>chrysura</i> , Kirb. . .	270	<i>podagricus</i> , V. d. L. . .	131
<i>floralis</i> , Kirb. . .	367	<i>hæ-norrhoidalis</i> , Fab. . .	270	<i>propinquus</i> , Shuck. . .	136
<i>Försterellus</i> , Kirb. . .	367	<i>leporina</i> , Panz. . .	271	<i>proximus</i> , Shuck. . .	136
<i>fragrans</i> , Kirb. . .	369	<i>tricincta</i> , Kirb. . .	271	<i>pterotus</i> , Fab. . .	143
<i>Francillonellus</i> , Kirb. . .	367	<i>Clytochrysus</i> , Mor. . .	140	<i>pubescens</i> , Shuck. . .	130
<i>Harrisellus</i> , Kirb. . .	368	<i>Cælioxys</i> , Latr. . .	312	<i>quadrinaculatus</i> , Fab. . .	137
<i>hortorum</i> , Linn. . .	368	<i>acuminata</i> , Nyl. . .	317	<i>scutatus</i> , Fab. . .	133
<i>Jonellus</i> , Smith . . .	373	<i>conica</i> , Kirb. . .	316	<i>scutellaris</i> , Smith . . .	136
<i>lapidarius</i> , Linn. . .	373	<i>elongata</i> , Lep. . .	316	<i>scutellatus</i> , Schv. . .	143
<i>lapponicus</i> , Fab. . .	375	<i>inermis</i> , Kirb. . .	316	<i>sercinctus</i> , Smith . . .	140
<i>Latreillellus</i> , Kirb. . .	369	<i>quadridentata</i> , Linn. . .	314	<i>signatus</i> , Panz. . .	139
<i>lucorum</i> , Smith . . .	378	<i>rufescens</i> , Lep. . .	315	<i>spinipectus</i> , Shuck. . .	135
<i>muscorum</i> , Kirb. . .	363	<i>simplex</i> , Nyl. . .	316	<i>tarsatus</i> , Shuck. . .	134
<i>nivialis</i> , Smith . . .	367	<i>umbrina</i> , Smith . . .	315	<i>tibialis</i> , Fab. . .	128
<i>nivalis</i> , Smith . . .	373	<i>vectis</i> , Curt. . .	313	<i>transversalis</i> , Shuck. . .	136
<i>pomorum</i> , Panz. . .	372	<i>Celocrobro</i> , Thoms. . .	129	<i>vagabundus</i> , Panz. . .	139
<i>pratorum</i> , Linn. . .	375	<i>Colletes</i> , Latr. . .	174	<i>vagus</i> , Linn. . .	142
<i>Raiellus</i> , Kirb. . .	371	<i>balteata</i> , Nyl. . .	178	<i>varius</i> , Lep. . .	135
<i>Scrimshiranus</i> , K. . .	373	<i>cunicularia</i> , Linn. . .	179	<i>vestitus</i> , Smith . . .	145
<i>senilis</i> , Smith . . .	366	<i>Daviesana</i> , Smith . . .	178	<i>vestillatus</i> , V. d. L. . .	145
<i>Smithianus</i> , White . . .	365	<i>fodiens</i> , Kirb. . .	177	<i>Walkeri</i> , Shuck. . .	132
<i>sorocensis</i> , Fab. . .	377	<i>marginata</i> , Smith . . .	178	<i>Wesmaeli</i> , V. d. L. . .	136
<i>Sowerbianus</i> , Kirb. . .	367	<i>pictistigma</i> , Thoms. . .	177	<i>Crossocerus</i> , Lep. . .	133
<i>subinterruptus</i> , Kirb. . .	375	<i>succincta</i> , Linn. . .	176	<i>Dasyopoda</i> , Latr. . .	272
<i>subterraneus</i> , Thoms. . .	369	<i>Crabro</i> , Fab. . .	124	<i>hirtipes</i> , Latr. . .	272
<i>subterraneus</i> , Auct. . .	368	<i>albilabris</i> , Fab. . .	146	<i>Sicammerdamella</i> , Kirb. . .	272
<i>svylvarum</i> , Linn. . .	370	<i>ambiguus</i> , Dahlb. . .	133	<i>Didineis</i> , Wesm. . .	112
<i>terrestris</i> , Linn. . .	378	<i>anxius</i> , Wesm. . .	135	<i>Kennedii</i> , Curt. . .	112
<i>Tunstallanus</i> , Kirb. . .	368, 369	<i>aphidum</i> , Lep. . .	132	<i>Junicornis</i> , Fab. . .	112
<i>variabilis</i> , Schmied. . .	366	<i>capitosus</i> , Shuck. . .	131	<i>Dinetus</i> , Jur. . .	82
<i>venustus</i> , Smith . . .	366	<i>cephalotes</i> , Panz. . .	140	<i>pictus</i> , Fab. . .	82
<i>virginalis</i> , Kirb. . .	378	<i>cestratus</i> , Shuck. . .	130	<i>Diodontus</i> , Curt. . .	94
<i>Calicurgus</i> , Lep. . .	70	<i>chrysostomus</i> , Lep. . .	141	<i>luperus</i> , Shuck. . .	95
<i>fasciatellus</i> , Shuck. . .	71	<i>clavipes</i> , Linn. . .	129	<i>minutus</i> , Fab. . .	95
<i>hyalinatus</i> , Fab. . .	71	<i>clypeatus</i> , Linn. . .	145	<i>tristis</i> , V. d. L. . .	96
<i>Cemonus</i> , Jur. . .	92	<i>cribrarius</i> , Linn. . .	142	<i>DIPLOPTERA</i> . . .	148
<i>Ceratina</i> , Latr. . .	307	<i>dimidiatus</i> , Fab. . .	138	<i>Diplorhoptum</i> . . .	41
<i>cyanea</i> , Fab. . .	307	<i>elongatulus</i> , V. d. L. . .	136	<i>Dufourea</i> , Lep. . .	276
<i>Ceratophorus</i> , Shuck. . .	94	<i>exiguus</i> , Shuck. . .	135	<i>vulgaris</i> , Schenck . . .	276
<i>Cerceria</i> , Fab. . .	116	<i>geniculatus</i> , Shuck. . .	137	<i>Entomognathus</i> , Dahlb. . .	147
<i>arenaria</i> , Linn. . .	119	<i>gonager</i> , Lep. . .	133	<i>brevis</i> , V. d. L. . .	147
<i>emarginata</i> , Panz. . .	118	<i>hyalinus</i> , Shuck. . .	136	<i>Epelous</i> , Latr. . .	305
<i>interrupta</i> , Panz. . .	120	<i>interruptus</i> , De G. . .	144		
<i>labiata</i> , Fab. . .	121	<i>interstinctus</i> , Smith . . .	140		
<i>ornata</i> , Schaf. . .	118	<i>Kollar</i> , Dahlb. . .	145		
		<i>leucostomus</i> , Linn. . .	129		

INDEX.

389

	PAGE		PAGE		PAGE
<i>productus</i> , Thoms.	303	<i>minutissimus</i> , Kirb.	223	<i>punctata</i> , Kirb.	346
<i>rufipes</i> , Thoms.	306	<i>minutus</i> , Kirb.	222	<i>Mollinus</i> , Fab.	113
<i>variegatus</i> , Smith 305, 306		<i>morio</i> , Fab.	225	<i>arvensis</i> , Linn.	114
Eucera , Scop.	343	<i>nitidiusculus</i> , Kirb.	221	<i>sabulosus</i> , Fab.	114
<i>longicornis</i> , Linn.	344	<i>oborata</i> , Kirb.	216	<i>Methoca</i> , Latr.	48
<i>Eumenes</i> , Latr.	170	<i>pauillus</i> , Schenck	217	<i>ichneumonides</i> , Latr.	48
<i>coarctata</i> , Linn.	170	<i>prasinus</i> , Smith	214	<i>Mimesa</i> , Shuck.	99
EUMENIDE	157	<i>punctatissimus</i> , Sch.	220	<i>ater</i> , Fab.	103
<i>Evagethes</i> , Lep.	57	<i>puncticollis</i> , Mor.	219	<i>bicolor</i> , Fab.	101
Form'ca , Linn.	19	<i>punctulatus</i> , Kirb.	219	<i>Dahlbomi</i> , Wesm.	102
<i>con erens</i> , Nyl.	20	<i>quadricinctus</i> , Fab.	209	<i>equestris</i> , Fab.	101
<i>cunicularia</i> , Latr.	22	<i>quadrinotatus</i> , Shuck.	212	<i>Shuckardi</i> , Wesm.	100
<i>exsecta</i> , Nyl.	21	<i>rubicundus</i> , Chr.	209	<i>unicolor</i> , V. d. L.	102
<i>fusca</i> , Linn.	22	<i>sexnotatus</i> , Kirb.	214	<i>Miscophus</i> , Jur.	83
<i>gagates</i> , Latr.	22	<i>Smeathmanellus</i> , K.	224	<i>bicolor</i> , Smith	83
<i>pratensis</i> , De Geer	20	<i>subfasciatus</i> , Nyl.	218	<i>concolor</i> , Dahlb.	83
<i>rufa</i> , Linn.	20	<i>tumulorum</i> , Linn.	223	<i>maritimus</i> , Smith	84
<i>rufibarbis</i> , Fab.	21	<i>villosulus</i> , Kirb.	219	<i>Miscus</i> , Jur.	88
<i>sanguinea</i> , Latr.	22	<i>xanthopus</i> , Kirb.	211	MONOMORIUM , Mayr.	41
FORMICIDÆ	18	<i>zonulus</i> , Smith	212	<i>Pharaonis</i> , Linn.	41
<i>Formicoxenus</i> , Mayr.	30	<i>Heriades</i> , Spin.	310	<i>Mutilla</i> , Linn.	44
<i>nitidulus</i> , Nyl.	31	<i>truncorum</i> , Linn.	311	<i>ephippium</i> , Fab.	46
<i>Westwoodi</i> , Smith	31	HETEROGYNA	16	<i>europæa</i> , Linn.	45
FOSSORES	42	<i>Hoplitis</i> , Lep.	107	<i>rufipes</i> , Latr.	46
<i>Gorytes</i> , Latr.	104	<i>Hoplocybro</i> , Thoms.	137	MUTILLIDÆ	44
<i>bicinctus</i> , Rossi	108	<i>Hoplopus</i> , Wesm.	160	<i>Myrmecina</i> , Curt.	31
<i>campestris</i> , Linn.	107	<i>Lasius</i> , Fab.	22	<i>Latreillei</i> , Curt.	32
<i>Farg'ii</i> , Shuck.	107	<i>alienus</i> , Först.	25	<i>Myrmica</i> , Latr.	38
<i>laticinctus</i> , Lep.	108	<i>flavus</i> , De Geer	24	<i>lævinodis</i> , Nyl.	40
<i>mystaceus</i> , Linn.	106	<i>fuliginosus</i> , Latr.	23	<i>lobicornis</i> , Nyl.	39
<i>quadrifasciatus</i> , Fab. 107		<i>mixtus</i> , Nyl.	24	<i>rubra</i> , Linn.	39
<i>tumidus</i> , Panz.	105	<i>niger</i> , Linn.	25	<i>ruginodis</i> , Nyl.	40
<i>Halictus</i> , Latr.	203	<i>umbratus</i> , Nyl.	24	<i>scabrinodis</i> , Nyl.	40
<i>abdominalis</i> , Kirb.	215	<i>Leptothorax</i> , Mayr.	36	<i>sulcinodis</i> , Nyl.	39
<i>aratus</i> , Kirb.	225	<i>acervorum</i> , Fab.	36	MYRMICIDÆ	29
<i>albipes</i> , Kirb.	216	<i>Nylanderi</i> , Först.	37	<i>Myrmica</i> , Latr.	47
<i>angusticeps</i> , Perk.	382	<i>tuberum</i> , Fab.	37	<i>melanocephala</i> , Fab.	47
<i>atricornis</i> , Smith	222	<i>unifasciatus</i> , Latr.	37	<i>Nomada</i> , Fab.	279
<i>breviceps</i> , Saund.	220	<i>Lindenius</i> , Lep.	146	<i>alboguttata</i> , H. S.	292
<i>brevicornis</i> , Saund.	220	<i>Macropis</i> , Panz.	268	<i>alternata</i> , Kirb.	290
<i>cylindricus</i> , Fab.	215	<i>labiata</i> , Fab.	269	<i>armata</i> , H. S.	298
<i>fulvicornis</i> , Kirb.	218	<i>Megachile</i> , Latr.	317	<i>atrata</i> , Smith	299
<i>fulvocincta</i> , Kirb.	215	<i>argentata</i> , Fab.	327	<i>baccata</i> , Smith	292
<i>gramineus</i> , Smith	224	<i>centuncularis</i> , Linn.	325	<i>bifida</i> , Thoms.	295
<i>lævigatus</i> , Kirb.	213	<i>circumcincta</i> , Lep.	322	<i>borealis</i> , Zett.	296
<i>lævis</i> , Kirb.	220	<i>oricetorum</i> , Lep.	324	<i>Bridgmanniana</i> , Smith	296
<i>lævis</i> , Thoms.	218	<i>Leachella</i> , Curt.	327	<i>caprea</i> , Kirb.	289
<i>leucopus</i> , Kirb.	225	<i>ligniseca</i> , Kirb.	323	<i>connexa</i> , Kirb.	287
<i>leucozonius</i> , Schr.	211	<i>maritima</i> , Kirb.	320	<i>cornigera</i> , Kirb.	289
<i>longiceps</i> , Saund.	220	<i>pyrina</i> , Smith	321	<i>Dalii</i> , Curt.	302
<i>longulus</i> , Smith	217	<i>versicolor</i> , Smith	326	<i>Fabriciana</i> , Linn.	300
<i>lugubris</i> , Kirb.	213	<i>Willughbiella</i> , Kirb.	321	<i>Fabriciella</i> , Kirb.	300
<i>maculatus</i> , Smith	210	<i>Melecta</i> , Latr.	344	<i>ferruginata</i> , Kirb.	299
<i>malachurus</i> , Kirb.	216	<i>armata</i> , Panz.	346	<i>glauca</i> , Kirb.	294
		<i>luctuosa</i> , Scop.	345		

PAGE		PAGE		PAGE	
flavoguttata, Kirb. . .	301	melanocephalus, Gmel. . .	161	PNEIDOLE, Westw. . .	42
flavopicta, Kirb. . .	291	oviventris, Thoms. . .	165	megacephala, Fab. . .	42
fucata, Panz. . .	286	parietinus, Linn. . .	166	Philanthus, Fab. . .	115
furva, Panz. . .	302	parietum, Linn. . .	164	triangulum, Fab. . .	115
germanica, Smith . . .	299	pictus, Curt. . .	165	PLAGIOLEPIS, Mayr. . .	26
Goodeniana, Kirb. . .	288	quadratus, Smith . . .	164	flavidula, Rog. . .	26
guttulata, Schenck . . .	293	reniformis, Gmel. . .	162	Pompilidæ . . .	53
Hillana, Kirb. . .	297	sinuatus, Fab. . .	169	Pompilus, Fab. . .	54
inquinata, Smith . . .	296	spinipes, Linn. . .	160	acuminatus, Smith . . .	53
jacobææ, Panz. . .	291	trifasciatus, Oliv. . .	166	approximatus, Smith . . .	60
leta, Thoms. . .	242	trimarginatus, Zett. . .	165	bicolor, Lep. . .	57
lateralis, Panz. . .	296	Osmia, Panz. . .	328	bicolor, Sm. . .	57
Lathburiana, Kirb. . .	291	avena, Smith . . .	334	cellularis, Thoms. . .	61
lineola, Panz. . .	289	atricapilla, Curt. . .	332	chalybeatus, Schiödte . . .	62
Marshallia, Kirb. . .	290	aurulenta, Panz. . .	337	cinctellus, Spin. . .	59
mistura, Smith . . .	284	bicolor, Schk. . .	336	consobrinus, Dhlb. . .	61
obtusifrons, Nyl. . .	281	bicornis, Kirb. . .	334	fenorali, V. d. L. . .	57
ochrostoma, Kirb. . .	297	cærulescens, Linn. . .	334	fuscus, Smith . . .	60
picta, Kirb. . .	285	claviventris, Thoms. . .	338	gibbus, Fab. . .	63
punctiscuta, Thoms. . .	247	cyanea, Fab. . .	334	melanarius, Bold. . .	60
quadrinotata, Kirb. . .	300	fulciformis, Smith . . .	331	minutulus, Dahlb. . .	61
Roberjeotiana, Panz. . .	285	fulviventris, Panz. . .	335	niger, Fab. . .	60
ruficornis, Linn. . .	294	Leaiana, Kirb. . .	335	pectinipes, V. d. L. . .	65
rufilabris, Thoms. . .	243	leucomelana, Kirb. . .	338	pectinipes, Smith . . .	62
rufiventris, Kirb. . .	291	parietina, Curt. . .	333	plumbeus, Fab. . .	60
rufocincta, Kirb. . .	332	pilicornis, Smith . . .	331	pulcher, Shuck. . .	60
rufopicta, Kirb. . .	285	rufa, Linn. . .	331	rupeus, Linn. . .	59
Schaefferella, Kirb. . .	247	spinulosa, Kirb. . .	339	sericeus, Shuck. . .	62
seccincta, Kirb. . .	239	tunensis, Kirb. . .	332	sericeus, V. d. L. . .	58
sexfasciata, Panz. . .	287	tunensis ♀, Kirb. . .	337	spissus, Schiödte . . .	62
Sheppardiana, Kirb. . .	302	xanthomelana, Kirb. . .	332	ungicularis, Thoms. . .	61
signata, Jur. . .	294	Oxybelus, Latr. . .	121	unicolor, Spin. . .	57
sol daginis, Panz. . .	285	argentatus, Curt. . .	123	viaticus, Linn. . .	60
subcornuta, Kirb. . .	284	ferox, Shuck. . .	123	Wesmaeli, Thoms. . .	64
succincta, Panz. . .	238	mandibularis, Dahlb. . .	123	Ponera, Latr. . .	28
varia, Smith . . .	286	mucronatus, Fab. . .	123	contracta, Latr. . .	28
vidua, Smith . . .	297	nigripes, Oliv. . .	123	punctatissima, Rog. . .	29
xanthosticta, Smith, 1st ed. . .	296	uniglumis, Linn. . .	122	tarda, Smith . . .	29
xanthosticta, Smith, 2nd ed. . .	284	Panurgus, Panz. . .	273	PONERIDE . . .	27
Nysson, Latr. . .	119	Banksianus, Kirb. . .	275	Prenolepis, Mayr. . .	25
dimidiatus, Jur. . .	111	calcaratus, Scop. . .	274	longicornis, Latr. . .	23
guttatus, Shuck. . .	111	ursinus, Gmel. . .	275	nitens, Mayr. . .	25
interruptus, Fab. . .	110	Passalocnus, Shuck. . .	97	polita, Smith . . .	25
spinosus, Fab. . .	110	corniger, Shuck. . .	97	Prionemites, Schiödte . . .	65
trimaculatus, Rossi . . .	111	gracilis, Curt. . .	98	Prosopis, Fab. . .	180
		insignis, V. d. L. . .	98	annulata, Kirb. . .	185
Odynerus, Latr. . .	158	monilicornis, Dahlb. . .	98	brevicornis, Nyl. . .	189
Antilope, Panz. . .	167	Pemphredon, Latr. . .	91	communis, Nyl. . .	185
basalis, Smith . . .	163	anthracinus, Smith . . .	91	confusa, Nyl. . .	188
bifasciatus, Wesm. . .	169	lethifer, Shuck. . .	93	cornuta, Smith . . .	182
callosus, Thoms. . .	164	lugubris, Latr. . .	93	dilatata, Kirb. . .	184
crassicornis, Panz. . .	168	morio, V. d. L. . .	94	dilatata, Saund. . .	181
elegans, Wesm. . .	169	Shuckardi, Mor. . .	92	genalis, Thoms. . .	189
gracilis, Brullé . . .	169	unicolor, Shuck. & 92, 93		hyalinata, Smith . . .	187
hevipes, Shuck. . .	161	Wesmaeli, Mor. . .	93	Masoni, Saund. . .	183
				perforator, Smith . . .	189
				pictipes, Nyl. . .	190

	PAGE		PAGE		PAGE
punctulatissima, Smith	186	parenlus, Dahlb.	70	Westwoodi, Westw.	35
punctulatissima ♂, Smith	188	pusillus, Schiötte	69	Stigmus, Jur.	90
rupestris, Smith	185	sepicola, Smith	66	pendulus, Smith	90
signata, Panz.	186	Sapyga, Latr.	51	Solskyl, Mor.	90
varipes, Smith	190	clavicornis, Linn.	52	Symmorphus, Wesm.	168
Psammophila, Dahlb.	88	cinquepunctata, Fab.	52	Tachytes, Panz.	79
Psen, Latr.	103	SAPYGINÆ	51	lativalvis, Thoms.	81
atratus, Panz.	104	Saropoda, Latr.	352	pectinipes, Linn.	81
pallipes, Panz.	104	bimaculata, Panz.	352	pompiliformis, Smith	81
Pseudagenia, Kohl.	71	Solenius, Lep.	142	unicolor, Panz.	80
carbonaria, Scop.	72	Solenopsis, Westw.	40	Tapinoma, Först.	26
punctum, Fab.	72	fugax, Latr.	41	erraticum, Latr.	27
Psithyrus, Lep.	353	Sphæcodes, Latr.	192	Tengyra, Ltr.	43
Albinella, Kirb.	355	affinis, v. Hag.	203	Savignoli, Ltr.	48
Barbutellus, Kirb.	357	dimidiatus, v. Hag.	203	Tetramorium, Mayr.	33
Barbutellus, Smith	358	divisus, v. Hag.	202	caespitum, Linn.	33
campestris, Panz.	357	ferruginatus, Sch.	201	guineense, Fab.	34
Francisana, Kirb.	357	gibbus, Linn.	197	Kollar, Smith	34
Leeana, Kirb.	357	hyalinatus, Schenck.	202	simillimum, Smith	34
quadricolor, Lep.	358	longulus, v. Hag.	199	Thyreopus, Lep.	142
Rossetta, Kirb.	357	niger, v. Hag.	200	Thyreus, Lep.	145
rupestris, Fab.	355	pilifrons, Thoms.	200	Tiphia, Fab.	49
subterranea, Kirb.	357	puncticeps, Thoms.	199	femorata, Fab.	50
vestalis, Fourc.	356	rubicundus, v. Hag.	381	minuta, V. d. L.	50
Rhopalum, Kirb.	128	reticulatus, Thoms.	197	TIPHIINÆ	49
Rophites, Spin.	277	similis, Wesm.	201	Trypoxylon, Latr.	84
quinquepinosus, Spin.	278	spinulosus, v. Hag.	198	attenuatum, Smith	86
Salix, Fab.	65	subquadratus, Smith	198	clavicerum, Lep.	86
affinis, V. d. L.	67	variegatus, v. Hag.	202	fulvus, Linn.	85
agilis, Shuck.	69	Spilomena, Shuck.	89	Vespa, Linn.	150
exaltatus, Fab.	68	troglodytes, V. d. Lind.	89	arborea, Smith	155
fuscus, Linn.	66	Stelis, Panz.	339	austriaca, Panz.	155
notatus, Saund.	68	aterrima, Panz.	340	crabro, Linn.	151
obtusiventris, Schiötte 69		octomaculata, Smith	341	germanica, Fab.	153
		phæoptera, Kirb.	341	norvegica, Fab.	156
		punctulatissima, K.	340	rufa, Linn.	154
		Stenamma, Westw.	34	sylvestris, Scop.	155
		lippula, Nyl.	35	vulgaris, Linn.	152

LONDON :

PRINTED BY GILBERT AND RIVINGTON, LIMITED,
ST. JOHN'S HOUSE, CLEKENWELL, E.C.

PLATE I.

FIG. 1. *Prionemis* ♀.

A. Head.	<i>Anterior wing.</i>	I. Upper basal cell.
A ¹ . Antenna.	1. Costal nervure.	II. Lower " "
A ² . Ocelli.	2. Post costal "	III. Marginal cell. "
B ¹ . Pronotum.	3. Median "	IV. 1st submarginal.
B ² . Mesonotum.	4. Posterior "	V. 2nd "
B ³ . Scutellum of ditto.	5. Stigma.	VI. 3rd "
B ⁴ . Metanotum and its post scutellum.	6. Marginal nervure.	VII. 1st discoidal.
B ⁵ . Propodeum.	7. Upper basal "	VIII. 3rd "
B ⁶ . Pecten of anterior tarsi.	8. Lower " "	IX. 2nd "
C ¹ to C ⁵ . Segments of abdo- men.	9. Cubital "	X. 1st apical.
D ¹ . Coxa of intermediate leg	10. Submarginal nervures.	XI. 2nd "
D ² . Trochanter "	11. 1st recurrent.	
D ³ . Femur "	12. 2nd "	
D ⁴ . Tibia "	<i>Posterior wing.</i>	
D ⁵ . Tarsi "	13. Anterior nervure.	
D ⁶ . Calcaria "	14. Median "	
	15. Posterior "	

FIG. 2. *Prionemis* ♀, head and thorax viewed sideways.

A. Clypeus.	L ¹ . Portion of mesopleura covered by pronotum in some positions.	T. Posterior portion of metanotum and meta- pleura.
B. Mandible.	M. Mesosternum.	U. Metasternum.
C. Eye.	N. Insertion of anterior wings.	V. Posterior coxa.
D. Antenna.	O. Scutellum.	W. " trochanter.
E. Pronotum.	P. Intermediate coxa.	X. " femur.
F. Prosternum.	Q. " trochanter.	Y. Insertion of posterior wings.
G. Anterior coxa.	R. " femur.	Z. Propodeum (or true 1st segment of abdomen).
H. " trochanter.	S. Post scutellum of meta- notum.	Z ¹ . Spiracle of propodeum.
I. " femur.		
J. Tubercle.		
K. Mesonotum.		
L. Mesopleura.		

FIG. 3.

Head of *Bombus* (late-
rally), mandibles
removed.

- A. Antenna.
- B. Eye.
- C. Cheek.
- D. Clypeus.
- E. Epipharynx.
- FF. Cardines.
- G. Lora.
- H. Submentum.
- I. Mentum.
- J. Ligula or lingua.
- K. Maxilla (stipes).
- L. " (blade or lacinia).
- MM. " palpi.
- N. Paraglossa.
- O. Labial palpus.
- P. Upper Sclerite of hypo-
pharynx.
- Q. Lower "
- R. Investing membrane.

FIG. 4.

Genital armature of
♂ *Psithyrus*.

- A. Cardio.
- BB. Stipites.
- CC. Laciniae.
- D. Spatha.
- EE. Sagittae.

FIG. 5.

Armature of *Andrena*.
Lettering as in Fig. 4.

FIG. 6.

Face of *Cerceris*.

- AA. Eyes.
- B. Ocelli.
- C. Insertion of Antenna.
- D. Clypeus.
- E. Labrum.
- FF. Mandibles.

FIG. 7.

Apical segments of
Halictus ♂ viewed
sideways.

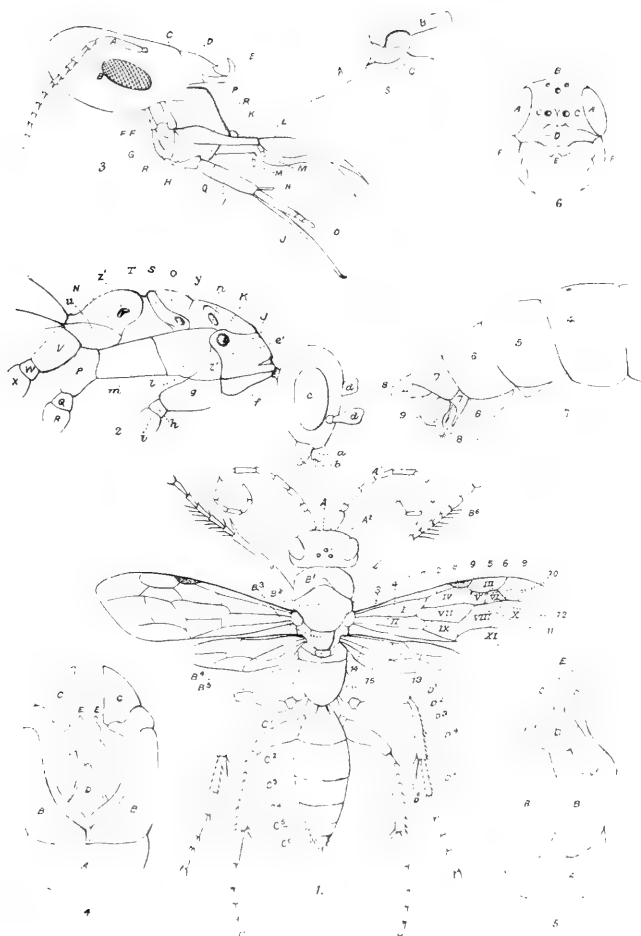
- 4. 4th segment.
- 5. 5th "
- 6, 6. Dorsal & ventral plates
of 6th.
- 7, 7. " of 7th.
- 8, 8. " of 8th.
- 9. Armature.

FIG. 8.

Arrangement in front
leg for cleaning
antennae.

- A. Tibia.
- B. Metatarsus with semi-
circular comb.
- C. Modified calcar of tibia
with sharp razor-like
edge.

PLATE I.



R. Morgan, del. et lith.

Vincent Brooks Day & Son, Lith.

L. Reeve & Co, London

PLATE II.

FIG. 1. *Formica sanguinea*, *Ltr.*, ♂

- | | | | |
|-----|----|--------------------------------|---------------------------------------|
| 2. | ,, | ,, | ♀ |
| 3. | ,, | ,, | ♀ |
| 3a. | ,, | ,, | clypeus |
| 4. | ,, | <i>exsecta</i> , <i>Nyl.</i> , | ♀ |
| 5. | ,, | ,, | ♀ |
| 5a. | ,, | ,, | (head) ♀ |
| 6. | ,, | <i>fusca</i> , <i>Ltr.</i> , | ♀, after losing wings |
| 7. | ,, | ,, | ♀ |
| 8. | ,, | <i>rufa</i> , <i>Linn.</i> , | clypeus |
| 9. | ,, | ,, | ♂ armature |
| 9a. | ,, | ,, | 8th dorsal segment showing penicilli. |





PLATE III.

- FIG. 1. *Lasius fuliginosus*, *Ltr.*, ♀
 2. „ *niger* *r. alienus* ♂
 3. „ „ ♀
 4. „ „ ♀
 5. „ *umbratus* *r. mixtus* ♂
 6. „ „ „ ♀
 7. „ „ „ ♀
 8. *Tapinoma* ♀ abdomen viewed laterally to
 show form of petiole
 9. *Lasius* ♀ „ „ „

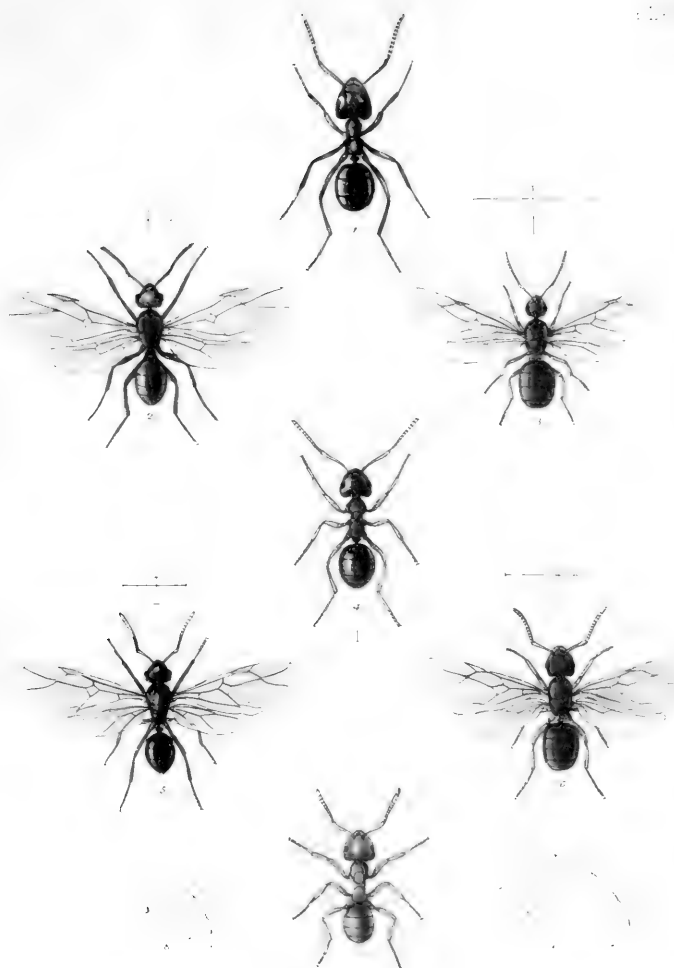


PLATE IV.

- FIG. 1. *Tapinoma erraticum*, *Ltr.*, ♂
2. ,, ,, ♀
3. *Ponera contracta*, *Ltr.*, ♂
4. ,, ,, ♀
4a. ,, ,, abdomen laterally
5. *Formicoxenus nitidulus*, *Nyl.*, ♀ (apterous)
5a. ,, ,, abdomen laterally
6. *Myrmecina Latreillei*, *Curt.*, ♂
7. ,, ,, ♀
7a. ,, ,, abdomen laterally

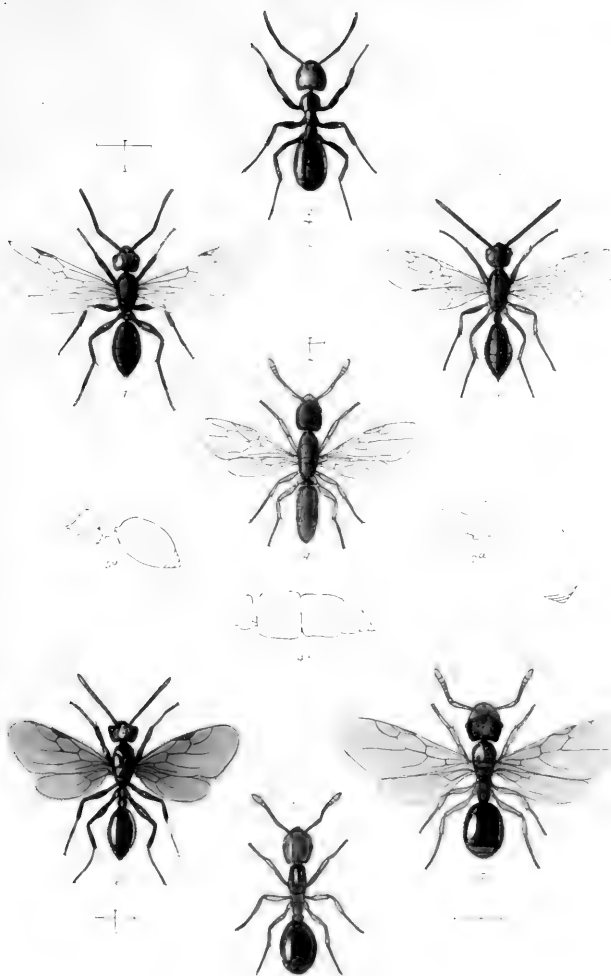


PLATE V.

FIG. 1. *Tetramorium cæspitum*, *Linn.*, ♂

1a. " " antenna.

2. " " ♀

3. " " ♂

3a. " " ♂ clypeus, &c.

4. *Leptothorax acervorum*, *Fab.*, ♂

5. " " ♀

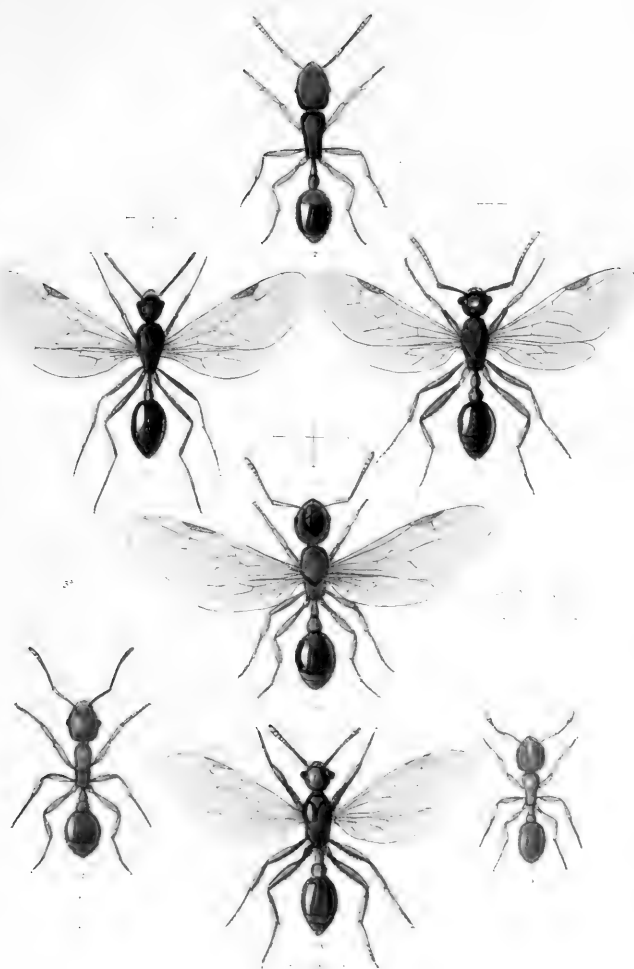
6. " " ♂

7. " *tuborum r.* *Nylander*, *Færst.*, ♀



PLATE VI.

- FIG. 1. *Stenamma Westwoodi*, *Westw.*, ♂
 2. ,, ,, ♀
 3. *Myrmica rubra*, *Fab.*, *r. ruginodis*, ♂
 3a. ,, ,, scape of antenna
 4. ,, ,, ♀
 5. ,, ,, ♀
 6. ,, *r. scabrinodis*, ♂
 7. ,, ,, scape of antenna
 8. ,, *r. lobicornis* ,,
 9. *Solenopsis fugax*, *Latr.*, ♀



D. Morgan, Del et lit.

Antenn. Pterocerae 4

L. Reeve & C. P. Linder

U.S.A. /
* 6611 /
UNIVERSITY OF ILLINOIS

PLATE VII.

- FIG. 1. *Mutilla europæa*, *Linn.*, ♂
2. „ „ „ ♀
3. *Myrmosa melanocephala*, *Fab.*, ♂
4. „ „ „ ♀
5. *Methoca ichneumonides*, *Ltr.*, ♂
6. „ „ „ ♀
7. *Sapyga*, 5 *punctata*, *Fab.*, ♀
8. „ *clavicornis*, *Linn.* ♂, antenna

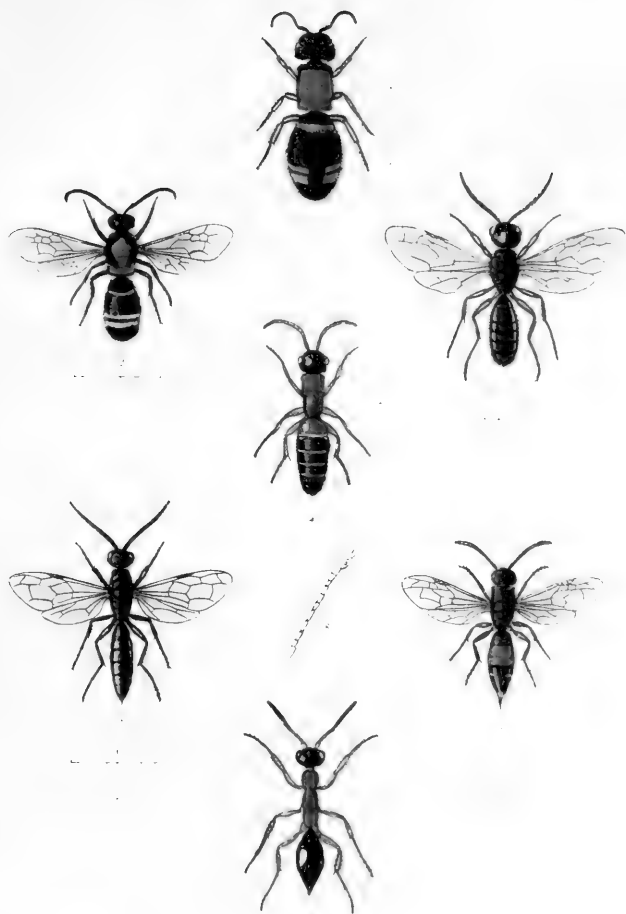


PLATE VIII.

- FIG. 1. *Tiphia femorata*, *Fab.*, ♀
2. *Pompilus* (subg. *Aporus*) *unicolor*, *Spin.*
3. " (subg. *Evagethes*) *bicolor* Lep.
 wing
4. " (subg. *Pompilus*) wing
5. " " *rufipes*, *Linn.*, ♂
6. " " " " ♀
7. " " *cinctellus*, *Spin.*, ♀
8. " " *niger*, *Fab.*, ♀
9. " " *plumbeus*, *Fab.*, ♂



PLATE IX.

- FIG. 1. *Pompilus viaticus*, *Linn.*, ♀
2. ,, *spissus*, *Schiödte*, ♂
- 2a. ,, ,, apical ventral valve
3. ,, ,, ♀
- 3a. ,, ,, anterior tarsus
4. ,, *chalybeatus*, *Schiödte*, ♀, anterior tarsus
5. ,, *minutulus*, *Dhlb.*, ♂, posterior tibia
6. ,, *gibbus*, *Fab.*, ♂, apical ventral valve
7. ,, *unguicularis*, *Thoms*, ♂, ditto
8. ,, *pectinipes*, *V. de L.*, ♂, ditto
9. *Salix fuscus*, *Linn.*, ♂
10. ,, ,, ♀
11. ,, *affinis*, *V. de L.*, ♂
12. ,, *exaltatus*, *Fab.*, ♀

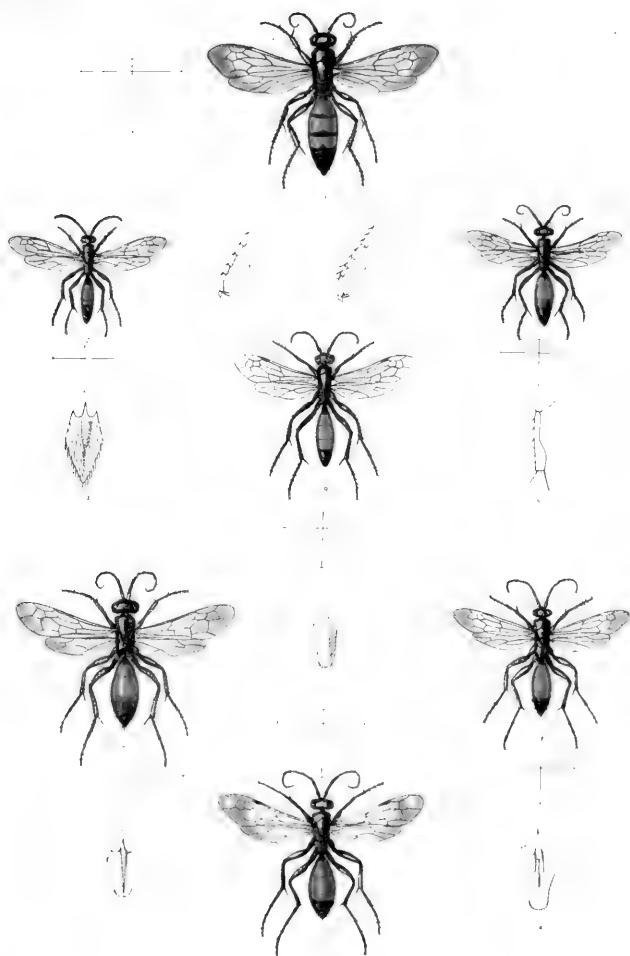


PLATE X.

FIG. 1. *Salix notatulus*, *Saund.*, ♂

2. „ *parvulus*, *Dhlb.*, ♀

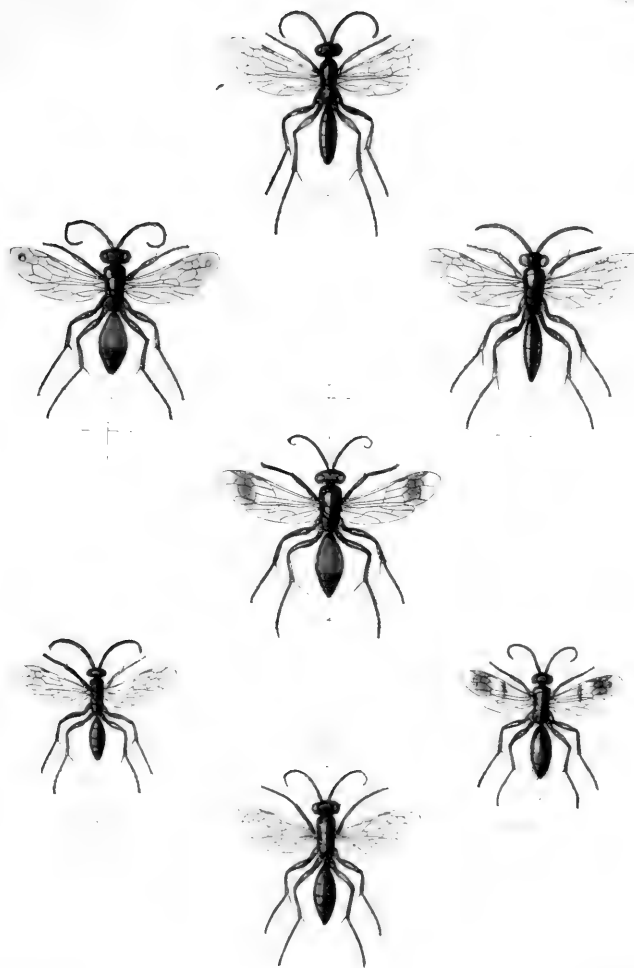
3. *Calicurgus hyalinatus*, *Fab.*, ♂

4. „ „ ♀

5. *Agenia variegata*, *Linn.*, ♂

6. „ „ ♀

7. *Pseudagenia punctum*, *Fab.*, ♀



1900

PLATE XL.

- FIG. 1. *Ceropales maculatus*, *Fab.*, ♀
2. „ *variegatus*, *Fab.*, ♀
3. *Astata boops*, *Schr.*, ♂
4. „ „ ♀
5. *Trypoxylon figulus*, *Linn.*, ♀
6. „ *attenuatum*, *Sm.*, ♀
7. *Tachytes pectinipes*, *Linn.*, ♀



PLATE XII.

- FIG. 1. *Tachytes unicolor*, *Panz.*, ♀
2. *Miscophus concolor*, *Dahlb.*, ♀
3. *Dinetus pictus*, *Fab.*, ♀
4. *Ammophila sabulosa*, *Linn.*, ♀
5. „ *campestris*, *Latr.*, ♂
6. „ *hirsuta*, *Scop.*, ♀



PLATE XIII.

- FIG. 1. *Spilomena troglodytes*, *V. d. Lind.*, ♂
2. *Stigmus Solskyi*, *Mor.*, ♀
3. *Pemphredon lugubris*, *Latr.*, ♀
4. „ *Shuckardi*, *Mor.*, ♂
5. „ *morio*, *V. de Lind.*, ♂
6. *Diodontus tristis*, *V. de Lind.*, ♀
7. *Passalæcus corniger*, *Shuck.*, ♀
8. „ *monilicornis*, *Dahlb.*, ♀



PLATE XIV.

FIG. 1. *Mimesa Shuckardi*, *Wesm.*, ♀

2. „ *bicolor*, *Fab.*, ♂

3. „ *atra*, *Fab.*, ♀

4. *Psen pallipes*, *Panz.*, ♀

5. *Gorytes tumidus*, *Panz.*, ♀

6. „ *mystaceus*, *Linn.*, ♂

7. „ *campestris*, *Linn.*, ♂



UNIVERSITY
OF
TORONTO

PLATE XV.

- FIG. 1. *Gorytes quadrifasciatus*, *Fab.*, ♀
2. „ *bicinctus*, *Rossi*, ♀
3. *Nysson spinosus*, *Fab.*, ♂
4. „ *dimidiatus*, *Jur.*, ♀
5. *Didineis lunicornis*, *Fab.*, ♂
6. „ „ „ ♀
7. *Mellinus arvensis*, *Linna.*, ♀



PLATE XVI.

- FIG. 1. *Philanthus triangulum*, *Fab.*, ♂
2. *Cerceris arenaria*, *Linn.*, ♀
3. ,, *quadricincta*, *Panz.*, ♀
4. ,, *ornata*, *Schæff.*, ♀
5. *Crabro tibialis*, *Fab.*, ♂
6. ,, *leucostomus*, *Linn.*, ♀



LIBRARY
OF THE
UNIVERSITY OF ILLINOIS

PLATE XVII.

- FIG. 1. *Crabro cetratus*, *Shuck.*, ♂
2. „ *gonager*, *Lep.*, ♂
3. „ *palmarius*, *Schreb.*, ♂
4. „ *palmipes*, *Linn.*, ♂
5. „ *anxius*, *Wesm.*, ♀
6. „ *elongatulus*, *V. d. Lind.*, ♀



100-1000
100-1000
100-1000



PLATE XVIII.

FIG. 1. *Crabro dimidiatus*, *Fab.*, ♀

2. „ *signatus*, *Panz.*, ♂

3. „ 4 *maculatus*, *Fab.*, ♀

4. „ *cribrarius*, *Linn.*, ♂

5. „ *scutellatus*, *Scher.*, ♀

6. „ *vagus*, *Linn.*, ♀



PLATE XIX.

- FIG. 1. *Crabro cephalotes*, *Panz.*, ♀
2. „ *chrysostomus*, *Lep.*, ♀
3. „ *clypeatus*, *Linn.*, ♂
4. „ *Panzeri*, *V. de Lind.*, ♀
5. *Entomognathus brevis*, *V. de Lind.*, ♀
6. *Oxybelus uniglumis*, *Linn.*, ♀



PLATE XX.

- FIG. 1. *Vespa crabro*, *Linn.*, ♂
2. „ *vulgaris*, *Linn.*, ♀
3. „ *germanica*, *Fab.*, ♀
4. „ *austriaca*, *Panz.*, ♀
5. „ *norvegica*, *Fab.*, ♀
6. *Odynerus basalis*, *Smith*, ♀



PLATE XXI.

- FIG. 1. *Odynerus spinipes*, *Linn.*, ♂
- | | | |
|----|---|---|
| 2. | „ | <i>reniformis</i> , <i>Gmel.</i> , ♀ |
| 3. | „ | <i>parietum</i> , <i>Linn.</i> , ♀ |
| 4. | „ | <i>trifasciatus</i> , <i>Oliv.</i> , ♀ |
| 5. | „ | <i>antilope</i> , <i>Panz.</i> , ♀ |
| 6. | „ | <i>crassicornis</i> , <i>Panz.</i> , ♀ |
| 7. | „ | <i>callosus</i> , <i>Thoms.</i> , lateral view of
1st and 2nd ventral segments. |
| 8. | „ | <i>parietum</i> , <i>Linn.</i> , lateral view of
1st and 2nd ventral segments. |
| 9. | „ | <i>parietinus</i> , <i>Linn.</i> , lateral view of
1st and 2nd ventral segments. |



PLATE XXII.

- FIG. 1. *Odynerus sinuatus*, *Fab.*, ♀
 2. *Eumenes coarctata*, *Linn.*, ♀
 3. *Colletes succincta*, *Linn.*, ♂
 4. " " ♀
 5. " *Daviesana*, *Smith*, ♀
 6. " *cunicularia*, *Linn.*, ♀
 7. " *succincta*, *Linn.*, ♂, armature.
 8. " *fodiens*, *Kirb.*, ♂, "
 9. " *picistigma*, *Thoms.*, ♂, "
 10. " *marginata*, *Smith*, ♂, "
 11. " *Daviesana*, *Smith*, ♂, "



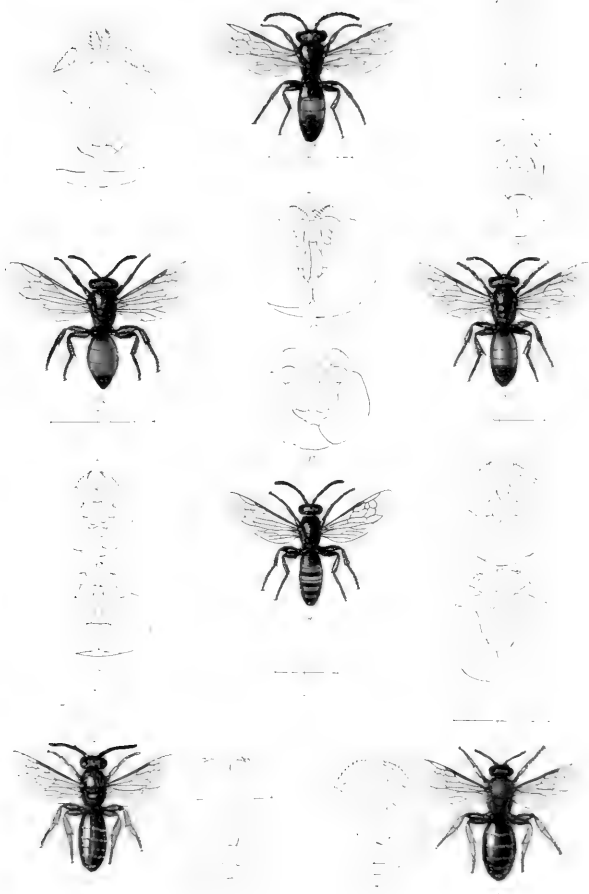
PLATE XXIII.

- FIG. 1. *Prosopis cornuta*, *Smith*, ♂
 2. „ *dilatata*, *Kirby*, ♂
 3. „ *signata*, *Panz.*, ♀
 4. „ *communis*, *Nyl.*, ♀
 5. „ *brevicornis*, *Nyl.*, ♂
 6. *Sphecodes subquadratus*, *Smith*, ♀
 7. *Prosopis cornuta*, *Smith*, ♂, 7th ventral segment.
 7a. „ „ 8th „
 8. „ *Masoni*, *Saund.*, ♂, 7th „
 8a. „ „ 8th „
 9. „ *communis*, *Nyl.*, ♂, 7th „
 9a. „ „ 8th „
 10. „ *hyalinata*, *Smith*, ♂, 7th „
 10a. „ „ 8th „
 11. „ *confusa*, *Nyl.*, ♂, 7th „
 11a. „ „ 8th „
 12. „ *signata*, *Panz.*, ♂, 7th „
 12a. „ „ 8th „
 13. „ *punctulatissima*, *Smith*, ♂, 7th „
 13a. „ „ 8th „
 14. „ *pictipes*, *Nyl.*, ♂, 7th „
 14a. „ „ 8th „
 15. „ *brevicornis*, *Nyl.*, ♂, 7th „
 15a. „ „ 8th „



PLATE XXIV.

- FIG. 1. *Sphecodes gibbus*, *Linn.*, ♂
 2. " " ♀
 3. " *pilifrons*, *Thoms.*, ♂
 4. " *variegatus*, *v. Hag.*, ♂
 5. *Halictus rubicundus*, *Christ.*, ♂
 6. " " ♀
 7. *Sphecodes gibbus*, *Linn.*, ♂, armature.
 8. " *reticulatus*, *Thoms.*, ♂, "
 9. " *subquadratus*, *Smith*, ♂, "
 10. " *pilifrons*, *Thoms.*, ♂, "
 11. " *similis*, *Wesm.*, ♂, "
 12. " *puncticeps*, *Thoms.*, ♂, "
 13. " *niger*, *v. Hag.*, ♂, "
 14. " *ferruginatus*, *Schk.*, ♂, "
 15. " *hyalinatus*, *Schk.*, ♂, "
 16. " *dimidiatus*, *v. Hag.*, ♂, "
 17. " *affinis*, *v. Hag.*, ♂, "



LIBRARY
OF THE
UNIVERSITY OF ILLINOIS

LIBRARY
OF THE
UNIVERSITY OF ILLINOIS

LIBRARY
OF THE
UNIVERSITY OF ILLINOIS

PLATE XXV.

- FIG. 1. *Haliectus quadricinctus*, *Fab.*, ♀
2. „ *maculatus*, *Smith*, ♂
3. „ *xanthopus*, *Kirb.*, ♀
4. „ *leucozonius*, *Schr.*, ♀
5. „ *sexnotatus*, *Kirb.*, ♀
6. „ *lævigatus*, *Kirb.*, ♀
7. „ *rubicundus*, *Chr.*, ♂, armature.
8. „ *quadricinctus*, *Fab.*, ♂, „
9. „ *maculatus*, *Smith*, ♂, „
10. „ *xanthopus*, *Kirb.*, ♂, „
11. „ *quadrinotatus*, *Kirb.*, ♂, „
12. „ *lævigatus*, *Kirb.*, ♂, „ lateral
[view.

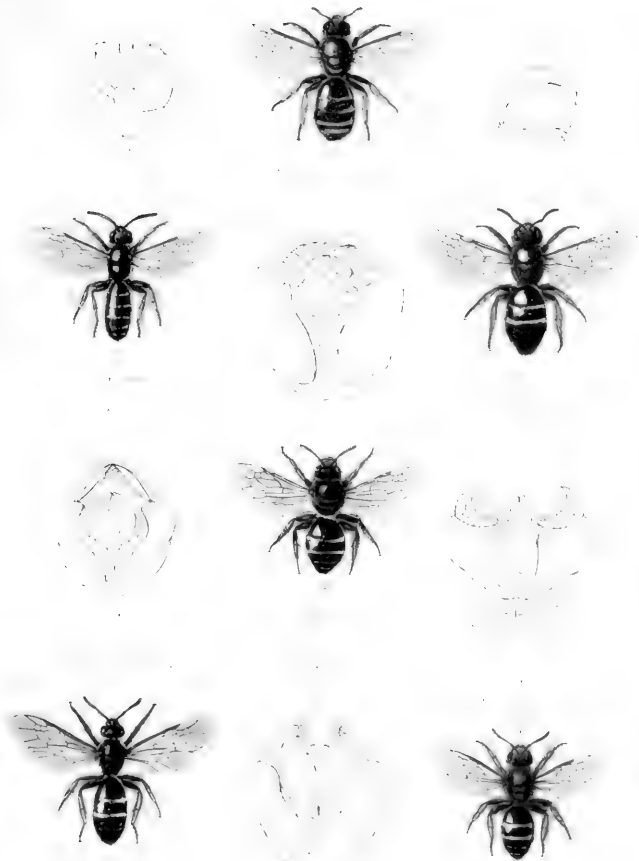


PLATE XXVI.

- FIG. 1. *Haliectus cylindricus*, *Fab.*, ♂
- | | | | | | |
|-----|---|-----------------------------------|---|-----------|----------------|
| 2. | „ | „ | „ | ♀ | |
| 3. | „ | <i>subfasciatus</i> , <i>Nyl.</i> | ♂ | | |
| 4. | „ | „ | „ | ♀ | |
| 5. | „ | <i>breviceps</i> , <i>Saund.</i> | ♂ | | |
| 6. | „ | <i>atricornis</i> , <i>Smith</i> | ♂ | | |
| 7. | „ | <i>prasinus</i> , <i>Smith</i> | ♂ | armature. | |
| 8. | „ | <i>cylindricus</i> , <i>Fab.</i> | ♂ | „ | |
| 9. | „ | <i>villosulus</i> , <i>Kirb.</i> | ♂ | „ | |
| 10. | „ | <i>minutus</i> , <i>Kirb.</i> | ♂ | „ | anterior view. |
| 11. | „ | <i>atricornis</i> , <i>Smith</i> | ♂ | „ | dorsal view. |
| 12. | „ | „ | „ | „ | anterior view. |



PLATE XXVII.

- FIG. 1. *Haliatus tumulorum*, *L.*, ♂
- | | | | |
|-----|----|--|-----------|
| 2. | ,, | ,, | ♀ |
| 3. | ,, | <i>gramineus</i> , <i>Smith</i> , | ♀ |
| 4. | ,, | <i>Smeathmanellus</i> , <i>Kirb.</i> , | ♀ |
| 5. | ,, | <i>Morio</i> , <i>Fab.</i> , | ♂ |
| 6. | ,, | <i>leucopus</i> , <i>Kirb.</i> , | ♂ |
| 7. | ,, | <i>tumulorum</i> , <i>L.</i> , ♂, | armature. |
| 8. | ,, | <i>Smeathmanellus</i> , <i>Kirb.</i> , | ♂, .. |
| 9. | ,, | <i>morio</i> , <i>Fab.</i> , | ♂, .. |
| 10. | ,, | <i>leucopus</i> , <i>Kirb.</i> , | ♂, .. |



PLATE XXVIII.

1. *Andrena albicans*, *Kirb.*, ♂
2. „ „ „ ♀
3. „ *pilipes*, *Fab.*, ♀
4. „ *tibialis*, *Kirb.*, ♀
5. „ *florea*, *Fab.*, ♀
6. „ *rosæ*, *Panz.*, *v. Trimmerana*, ♂



PLATE XXIX.

FIG. 1. *Andrena rosæ*, *Panz.*, var. *spinigera*, ♂

2. „ „ „ ♀

3. „ *cineraria*, *Linn.*, ♀

4. „ *thoracica*, *Fab.*, ♀

5. „ *nitida*, *Fourc.*, ♀

6. „ *Clarkella*, *Kirb.*, ♀



PLATE XXX.

FIG. 1. *Andrena fulva*, *Schr.*, ♂

- | | | | |
|----|---|-----------------------------------|---|
| 2. | „ | „ | ♀ |
| 3. | „ | <i>Gwynana</i> , <i>Kirb.</i> , | ♀ |
| 4. | „ | <i>angustior</i> , <i>Kirb.</i> , | ♀ |
| 5. | „ | <i>apicata</i> , <i>Smith</i> , | ♀ |
| 6. | „ | <i>fucata</i> , <i>Smith</i> , | ♀ |



PLATE XXXI.

FIG. 1. *Andrena ferox*, *Smith*, ♂

2. „ „ ♀

3. „ *bucephala*, *Steph.*, ♂

4. „ *nigriceps*, *Kirb.*, ♀

5. „ *denticulata*, *Kirby*, ♀

6. „ *fulvius*, *Kirb.*, ♀



PLATE XXXII.

FIG. 1. *Andrena fasciata*, *Nyl.*, ♀

2. „ *Hattorfiana*, *Fab.*, ♂

3. „ „ „ ♀

4. „ *Cetii*, *Schr.*, ♀

5. „ *cingulata*, *Fab.*, ♂

6. „ *albicus*, *Krb.*, ♀

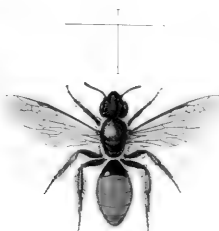
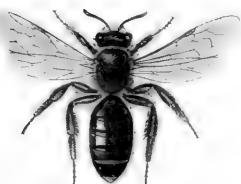






PLATE XXXIII.

FIG. 1. *Andrena chrysosceles*, *Kirb.*, ♂

2. „ *analys*, *Panz.*, ♀

3. „ *humilis*, *Imh.*, ♀

4. „ *labialis*, *Kirb.*, ♀

5. „ *nana*, *Kirb.*, ♀

6. „ *dorsata*, *Kirb.*, ♀

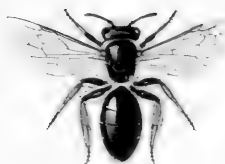


PLATE XXXIV.

- FIG. 1. *Andrena Afzeliella*, *Kirb.*, var. *fuscata*, ♀
2. „ *Wilkella*, *Kirb.*, ♀
3. „ *similis*, *Smith*, ♂
4. „ „ ♀
5. *Macropis labiata*, *Fab.*, ♂
6. „ „ ♀



PLATE XXXV.

-
- FIG. 1. *Dasypoda hirtipes*, *Latr.*, ♂
 2. „ „ ♀
 3. *Cilissa hæmorrhoidalis*, *Fab.*, ♀
 4. „ *leporina*, *Panz.*, ♂
 5. „ „ ♀
 6. *Panurgus calcaratus*, *Scop.*, ♂
 7. *Macropis labiata*, *Fab.*, ♂ armature.
 8. „ „ 7th ventral segment.
 9. *Dasypoda hirtipes*, *Latr.*, ♂ armature.
 10. *Cilissa hæmorrhoidalis*, *Fab.*, ♂ „
 11. *Panurgus calcaratus*, *Scop.*, ♂ „

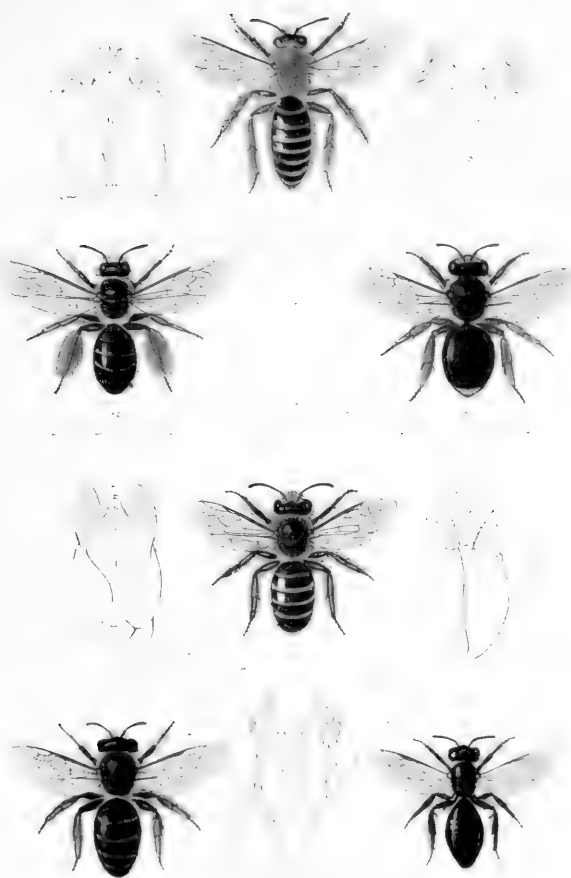


PLATE XXXVI.

- FIG. 1. *Panurgus ursinus*, *Gmel.*, ♀
2. *Dufourea vulgaris*, *Schk.*, ♀
3. *Rophites quinquespinosus*, *Spin.*, ♀
4. *Nomada fucata*, *Panz.*, ♀
5. „ *solidaginis*, *Panz.*, ♀
6. „ „ var., ♀
7. *Panurgus ursinus*, *Gmel.*, ♂ armature.
8. *Rophites quinquespinosus*, *Spin.*, ♂ armature.
9. *Dufourea vulgaris*, *Schk.*, ♂ armature.



PLATE XXXVII.

- FIG. 1. *Nomada sexfasciata*, *Panz.*, ♂
2. „ *succincta*, *Panz.*, ♀
3. „ *lineola*, *Panz.*, ♂
4. „ *alternata*, *Kirb.*, ♀
5. „ *Lathburiana*, *Kirb.*, ♀
6. „ *alboguttata*, *H.-S.*, ♀
7. „ *sexfasciata*, *Panz.*, ♂ armature.
- 7a. „ „ 8th ventral segment.
8. „ *succincta*, *Panz.*, ♂ armature.
- 8a. „ „ 8th ventral segment.
9. „ *alternata*, *Kirb.*, ♂ armature.
- 9a. „ „ 8th ventral segment.
10. „ *Lathburiana*, *Kirb.*, ♂ armature.
- 10a. „ „ 8th ventral segment.
11. „ *alboguttata*, *H.-S.*, ♂ armature.
- 11a. „ „ 8th ventral segment.



PLATE XXXVIII.

-
- FIG. 1. *Nomada lateralis*, *Panz.*, ♀
2. ,, *ruficornis*, *Linn.*, ♂
3. ,, ,, ♀
4. ,, ,, var. *signata*, ♀
5. ,, *borealis*, *Zett.*, ♀
6. ,, *ochrostoma*, *Kirb.*, ♂
7. ,, *lateralis*, *Panz.*, ♂ armature.
- 7*a.* ,, ,, 8th ventral segment.
8. ,, *ruficornis*, *Linn.*, ♂ armature.
- 8*a.* ,, ,, 8th ventral segment.
9. ,, *bifida*, *Thoms.*, ♂ armature.
- 9*a.* ,, ,, 8th ventral segment.
10. ,, *ochrostoma*, *Kirb.*, ♂ armature.
- 10*a.* ,, ,, 8th ventral segment.



PLATE XXXIX.

FIG. 1. *Nomada Roberjeotiana*, *Panz.*, ♀

2. „ *obtusifrons*, *Nyl.*, ♀
3. „ *armata*, *H.-S.*, ♀
4. „ *ferruginata*, *Kirb.*, ♂
5. „ *Fabriciana*, *Linn.*, ♀
6. „ *furva*, *Panz.*, ♂
7. „ *Roberjeotiana*, *Panz.*, ♂ armature.
- 7a. „ „ 8th ventral segment.
8. „ *obtusifrons*, *Nyl.*, ♂ armature.
9. „ *ferruginata*, *Kirb.*, ♂ armature.
- 9a. „ „ 8th ventral segment.
10. „ *Fabriciana*, *Linn.*, ♂ armature.
- 10a. „ „ 8th ventral segment.
11. „ *flavoguttata*, *Kirb.*, ♂ armature.
- 11a. „ „ 8th ventral segment.
12. „ *furva*, *Panz.*, ♂ armature.
- 12a. „ „ 8th ventral segment.



PLATE XL.

- FIG. 1. *Epeolus rufipes*, *Thoms.*, ♀
2. *Ceratina cyanea*, *Kirb.*, ♀
3. *Chelostoma florisomne*, *Linn.*, ♂
4. ,, ,, ♀
5. ,, *campanularum*, *Kirb.*, ♂
6. *Cœlioxys quadridentata*, *Linn.*, ♀
7. *Epeolus productus*, *Thoms.*, ♂ armature.
8. ,, *rufipes*, *Thoms.*, ,,
9. *Ceratina cyanea*, *Kirb.*, ,,
10. *Chelostoma florisomne*, *Linn.*, ,,
11. ,, ,, 5th ventral segment.
12. ,, *campanularum*, *Kirb.*, ♂ armature.
13. *Cœlioxys quadridentata*, *Linn.*, ,,





PLATE XLI.

- FIG. 1. *Cælioxys vectis*, *Curt.*, ♂
 2. ,, ,, ♀
 3. ,, *acuminata*, *Nyl.*, ♀
 4. *Megachile maritima*, *Kirb.*, ♂
 5. ,, ,, ♀
 6. ,, *circumcineta*, *Lep.*, ♀
 7. *Cælioxys vectis*, *Curt.*, ♂ armature.
 8. ,, *rufescens*, *Lep.*, ,,
 9. ,, *acuminata* *Nyl.*, ,,
 10. *Megachile maritima*, *Kirb.*, ,,
 11. ,, *Willughbiella*, *Kirb.*, ,,
 12. ,, *circumcineta*, *Lep.*, ,,
 13. ,, *maritima*, *Kirb.*, 6th ventral segment.
 13*a.* ,, ,, hairs of disc much enlarged.
 14. ,, *Willughbiella*, *Kirb.*, 6th ventral segment.
 14*a.* ,, ,, hairs of disc much enlarged.
 15. ,, *circumcineta*, *Lep.*, 6th ventral segment.
 15*a.* ,, ,, hairs of disc much enlarged.



PLATE XLII.

- FIG. 1. *Megachile ligniseca*, *Kirb.*, ♂
 2. ,, *argentata*, *Fab.*, ♀
 3. *Osmia rufa*, *Linna.*, ♂
 4. ,, ,, ♀
 5. ,, *pilicornis*, *Sm.*, ♂
 6. ,, ,, ♀
 7. *Megachile ligniseca*, *Kirb.*, ♂ armature.
 8. ,, ,, ♂ 6th ventral segment.
 8a. ,, ,, hairs of disc much enlarged.
 9. ,, *centuncularis*, *Linna.*, ♂ armature.
 10. ,, ,, ♂ 6th ventral segment.
 10a. ,, ,, hairs of disc much enlarged.
 11. ,, *argentata*, *Fab.*, ♂ armature.
 12. ,, ,, ♂ 6th ventral segment.
 12a. ,, ,, hairs of disc much enlarged.
 13. *Osmia rufa*, *Linna.*, ♂ armature.
 14. ,, *pilicornis*, *Sm.*, ♂ armature.

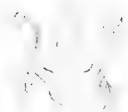
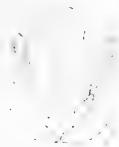


PLATE XLIII.

- FIG. 1. *Osmia xanthomelana*, *Kirb.*, ♂
2. „ *parietina*, *Curt.*, ♀
3. „ *cærulescens*, *Linn.*, ♂
4. „ „ „ ♀
5. „ *aurulenta*, *Panz.*, ♂
6. „ „ „ ♀
7. „ *xanthomelana*, *Kirb.*, ♂ armature.
8. „ *parietina*, *Curt.*, „
9. „ *cærulescens*, *Linn.*, „
10. „ *fulviventris*, *Panz.*, „
11. „ *aurulenta*, *Panz.*, „



[Faint handwritten notes]

PLATE XLIV.

-
- FIG. 1. *Osmia bicolor*, *Schr.*, ♀
 2. „ *leucomelana*, *Kirb.*, ♂
 3. „ „ „ ♀
 4. *Anthidium manicatum*, *Linn.*, ♂
 5. „ „ „ ♀
 6. *Stelis aterrima*, *Panz.*, ♀
 7. *Osmia bicolor*, *Schr.*, ♂ armature.
 8. „ *leucomelana*, *Kirb.*, „
 9. „ *spinulosa*, *Kirb.*, „
 10. *Anthidium manicatum*, *Linn.*, „
 11. *Stelis aterrima*, *Panz.*, „



—



—



... ..

PLATE XLV.

- FIG. 1. *Eucera longicornis*, *Lin.*, ♂
 2. „ „ „ ♀
 3. *Melecta armata*, *Panz.*, ♀
 4. „ *luctuosa*, *Scop.*, ♀
 5. *Anthophora furcata*, *Panz.*, ♂
 6. „ „ „ ♀
 7. *Eucera longicornis*, *Lin.*, ♂ armature.
 8. *Melecta armata*, *Pz.*, ♂ armature.
 9. „ *luctuosa*, *Scop.*, ♂ 7th ventral segment.
 10. „ „ „ ♂ armature.
 11. „ *armata*, *Pz.*, ♂ 7th ventral segment.
 12. *Saropoda bimaculata*, ♂ armature.
 13. „ „ „ 7th ventral segment.



PLATE XLVI.

- FIG. 1. *Anthophora retusa*, *Linn.*, ♂
 2. " " ♀
 3. " *pilipes*, *Fab.*, ♂
 4. " *quadrimaculata*, *Pz.*, ♀
 5. *Saropoda bimaculata*, *Pz.*, ♂
 6. " " ♀
 7. *Anthophora retusa*, *Linn.*, ♂ armature.
 8. " " ♂ 7th ventral segment.
 9. " *pilipes*, *Fab.*, ♂ armature.
 10. " " 7th ventral segment.
 11. " *quadrimaculata*, *Pz.*, ♂ armature.
 12. " " 7th ventral segment.
 13. " *furcata*, *Pz.*, ♂ armature.
 14. " " 7th ventral segment.



PLATE XLVII.

- FIG. 1. *Psithyrus rupestris*, *Fab.*, ♂
2. ,, ,, ♀
3. ,, *vestalis*, *Fourc.*, ♂
4. ,, *campestris*, *Pz.*, ♂
5. ,, ,, ♀
6. ,, *quadricolor*, *Lep.*, ♂
7. ,, *rupestris*, *Fab.*, ♂ armature.
8. ,, *vestalis*, *Fourc.*, ,,
9. ,, *Barbutellus*, *Kirb.*, ,,
10. ,, *campestris*, *Panz.*, ,,
11. ,, *quadricolor*, *Lep.*, ,,

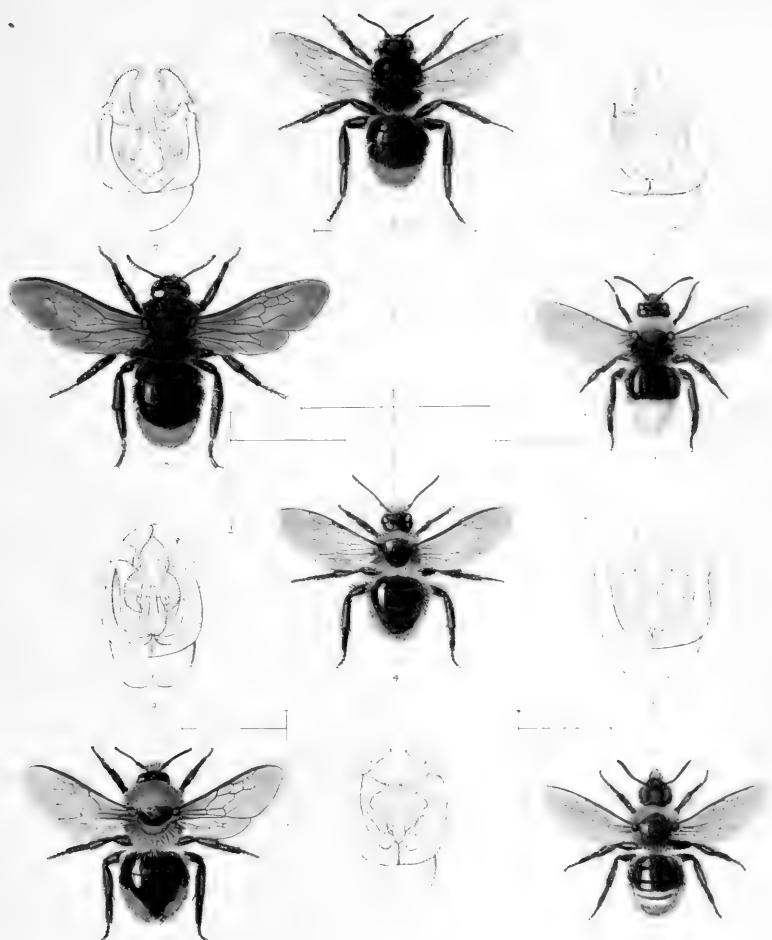


PLATE XLVIII.

FIG. 1. *Bombus Smithianus*, *White*, ♂

2. „ „ ♀

3. „ *venustus*, *Smith*, ♀

4. „ *agrorum*, *Fab.*, ♂

5. „ „ ♀

6. „ „ ♀ var.

7. „ *Smithianus*, *White*, ♂ armature.

8. „ *venustus*, *Smith*, „

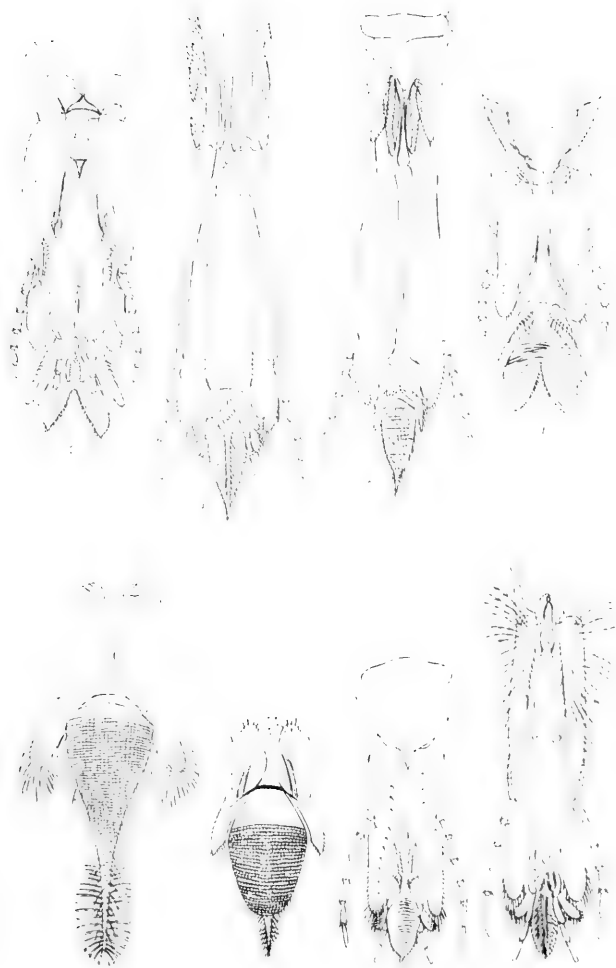
9. „ *agrorum*, *Fab.*, „



PLATE Ia.

FIG. 1. Colletes, mouth parts, front view.

- | | | | | |
|----|---------------------------------|---|-------|---|
| 2. | „ | „ | back | „ |
| 3. | Halictus | „ | front | „ |
| 4. | „ | „ | back | „ |
| 5. | Andrena | „ | front | „ |
| 6. | „ | „ | back | „ |
| 7. | Cilissa, tongue and paraglossæ. | | | |
| 8. | Macropis | „ | „ | |



Wm. C. Cresson

Plate 1421-1428

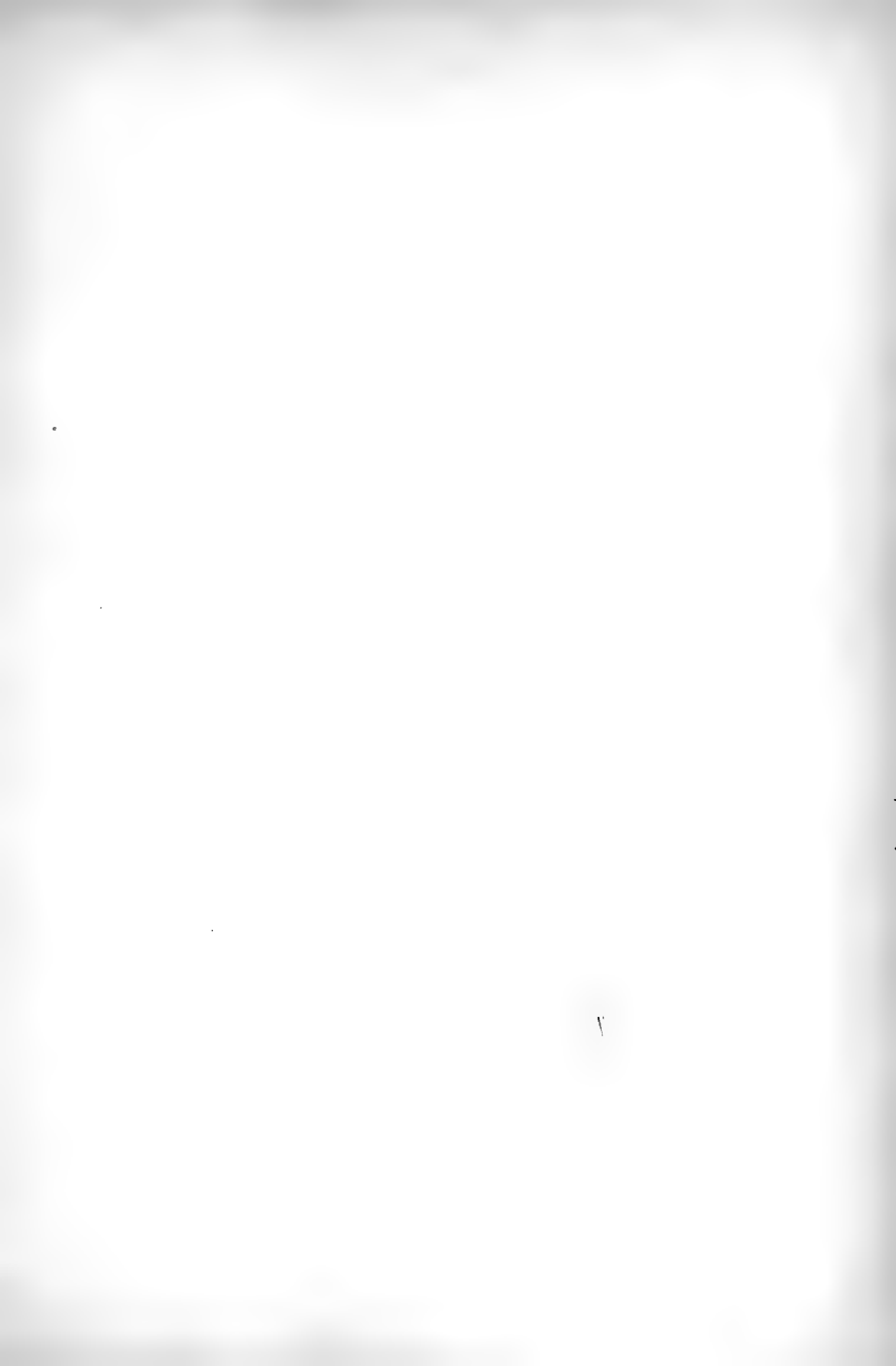
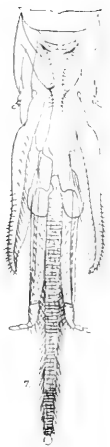


PLATE Ib.

FIG. 1. Panurgus, mouth parts, back view,

2. Nomada	„	„	„
3. Megachile	„	front	„
4. Melecta	„	back	„
5. Anthophora	„	front	„
6. Bombus	„	„	„
7. Apis	„	„	„



17
GEORGE
OF ILLINOIS

PLATE XLIX.

FIG. 1. *Bombus hortorum*, *Linnaeus*, ♂

2. „ „ ♀

3. „ „ ♀ var. *Harrisellus*.

4. „ *Latreillellus*, *Kirby*, ♂

5. „ „ ♀

6. „ „ ♀ var. *distinguendus*.

7. „ *hortorum*, ♂ armature.

8. „ *Latreillellus*, „

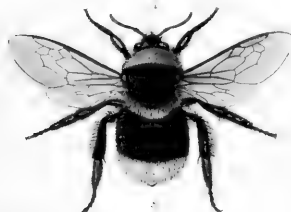
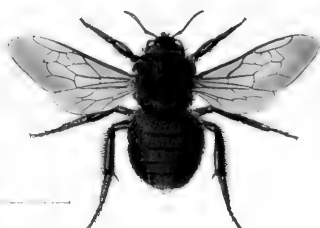
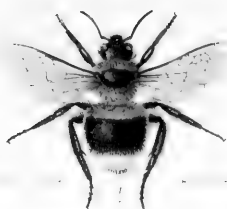


PLATE L.

FIG. 1. *Bombus sylvarum*, *Linn.*, ♀

- | | | | |
|-----|---|------------------------------------|-----------|
| 2. | „ | <i>Derhamellus</i> , <i>Kirb</i> , | ♂ |
| 3. | „ | „ | ♀ |
| 4. | „ | <i>pomorum</i> , <i>Panz.</i> , | ♀ |
| 5. | „ | <i>lapidarius</i> , <i>Linn.</i> , | ♂ |
| 6. | „ | „ | ♀ |
| 7. | „ | <i>sylvarum</i> , ♂ | armature. |
| 8. | „ | <i>Derhamellus</i> , | „ |
| 9. | „ | <i>pomorum</i> , | „ |
| 10. | „ | <i>lapidarius</i> , | „ |



17
1000-1000-1000

PLATE LI.

FIG. 1. *Bombus Jonellus*, *Kirb.*, ♂

2. „ „ ♀

3. „ *lapponicus*, *Fieb.*, ♂

4. „ „ ♀

5. „ *pratensis*, *Linna.*, ♀

6. „ *Cullumanus*, *Kirb.*, ♀

7. „ *pratensis*, ♂ armature.

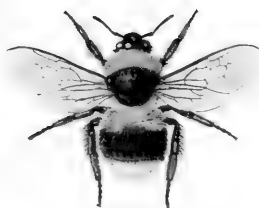


PLATE LII.

FIG. 1. *Bombus soroensis*, *Fab.*, ♂

2. „ *terrestris*, *Linn.*, ♂

3. „ „ ♀

4. *Apis mellifica*, *Linn.*, ♂

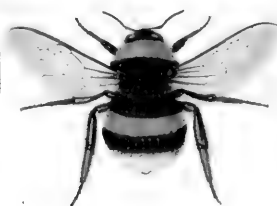
5. „ „ ♀

6. „ „ ♀

7. *Bombus soroensis*, ♂ armature.

8. „ *terrestris*, „

9. <i>Apis mellifica</i> ,	}	parts of ♂ armature.
9a. „ „		
9b. „ „		



1000
6 7 13
1000 1000 1000





UNIVERSITY OF ILLINOIS-URBANA

595 79SABH

C001

THE HYMENOPTERA ACULEATA OF THE BRITISH



3 0112 010066816